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THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER
ELECTRO-PLATERS REVIEW

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Egyptian Lacquer

in the beautiful Book-Cadillac

Elevator door, new Book-Cadillac Hotel, Detroit, finished with Egyptian Florentine Gold Lacquer—a thin, imperceptible film for the preservation and enchantment of the natural beauty of the bronze. Courtesy of W. S. Tyler & Co.

VISITORS from all over the world are impressed by the beauty of the new Book-Cadillac Hotel, Detroit. The elevator door, illustrated here, has won the commendation of leading architects and interior decorators and of connoisseurs whose judgment in matters of art is undisputed. It is fashioned of the finest cast bronze and finished with transparent Egyptian Florentine Gold Lacquer.

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THE
METAL INDUSTRY
WITH WHICH ARE INCORPORATED
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ELECTRO-PLATERS REVIEW

Vol. 25 NEW YORK, MARCH, 1927 No. 3

Annual Meeting of the Institute of Metals Division

A Report of the Sessions Held in New York February 15-18, 1927

The Institute of Metals Division of the A. I. M. E. held its winter meeting from February 15-18, 1927, inclusive at the Engineering Societies Building, 29 West 39th Street, New York.

The program was one of the largest and most comprehensive ever offered by the Institute, resulting in the attraction of an attendance probably greater than ever recorded at an Institute meeting.

At the annual banquet, Secretary Corse reported that the membership totalled about 800 and that finances were in about the same satisfactory condition.

The present officers were re-elected for another year, following the policy of the Institute to keep its staff in office for a period of two years. A new Executive Committe was elected, however. This committee now consists of the chairmen of the various committees handling the different activities of the Institute.

Chairman: Dr. P. D. Merica, New York.

Vice-chairman: Dr. Zay Jeffries, Cleveland, Ohio.

Secretary-treasurer: W. M. Corse, Washington, D. C.

Executive Committee: J. R. Freeman, chairman of the Committee of Local Sections; **R. S. Archer,** chairman of the Committee on Data Sheets; **E. C. Bain,** chairman of the Committee on Publications in Mining and Metallurgy; **S. Skowronski,** chairman of the Committee on Papers; **H. C. Jennison,** chairman of Membership Committee; **L. W. Spring,** member at large.

The chairman of the various committees reported on their work giving outlines of the status of their problems.

W. H. Bassett explained that the Institute was now co-operating with the American Foundrymen's Association, The American Society for Testing Materials and the American Society for Steel Treating. Data sheets were being prepared for the use of the American Society for Steel Treating, and copies would be distributed to members of the Institute of Metals also.

FALL MEETING WITH STEEL TREATERS

Due to the change in the plans of the American Foundrymen's Association, who were meeting for 1927 in June, the Institute decided not to join them this year but to meet with the Steel Treaters in Detroit in September, 1927. This plan is only tentative, depending upon the arrangements made in the future by the various societies involved.

Dr. Jeffries announced that the Iron and Steel Division of the A. I. M. E., had asked for a paid secretary in order to improve their service to their members. They asked that the Institute of Metals join them in this undertaking. A committee was appointed to work out a plan with the Iron and Steel Division.

Dr. Merica reported that a list of problems had been drawn up by the Research Committee after careful consideration and those of the greatest importance were taken under advisement for placement in industrial and university research laboratories. On this list are the following:

SELECTED LIST OF RESEARCH PROBLEMS

Solubility of lead in brass and effect of lead on the Alpha Beta solubility curves of brass diagram. (J. L. Christie).

Iron Zinc equilibrium diagram. (H. W. Gillett).

The joining of metals. (S. L. Hoyt).

High temperature chemistry of metals and alloys with particular reference to gases. (P. D. Merica).

Influence of varying quantities of aluminum on non-ferrous alloys subject to hydrostatic tests (N. K. B. Patch).

Research work on silver alloys. (S. Skowronski).

The National Research Council is co-operating with the Institute in arranging for work on these problems.

Mr. Freeman announced that speakers for local sections were being scheduled and also plans were being made to advise members of lectures on non-ferrous metals at meetings of other societies.

PROFESSOR MATHEWSON 1928 LECTURER

Dr. Merica announced that the 1928 annual lecture would be delivered by Professor C. H. Mathewson of Yale University.

Dr. C. H. Desch of Sheffield, England, described the work of the British Institute of Metals and other metallurgical societies of his country. Dr. Desch delivered the annual lecture of the Institute for 1927, an abstract of which will be found later in this report.

Dr. Jeffries was publicly congratulated upon his receipt of the Douglas medal for 1927 and replied expressing his appreciation of the honor.

Mr. Singmaster of the New Jersey Zinc Company delivered a talk on the zinc industry describing the various channels into which zinc went and explaining the ramifications of the industry. He showed some interesting samples of a new zinc base die casting alloy of the composition zinc 92.9; aluminum 4; copper 3; magnesium .1, with unusual properties of resistance to swelling and warping.

PREPARATION OF METALLIC SINGLE CRYSTALS AND TWINNING IN ZINC AND ZINC SINGLE CRYSTALS

By Orlando E. Romic, Vandergrift, Pa.

The physical characteristics of a metal or alloy are closely related to the properties of the individual crystals. The importance of these crystals is increased by the use of X-ray spectograph as a metallurgical tool, because interpretation of the spectographs is difficult unless single crystals are used in such studies.

Examination of individual planes of brittle single-crystal zinc wires under the micrscope showed that "Neumann bands," "bandings" or "twins" are caused by straining the metal, compression being the most likely to cause them. The planes on which twins occur are given as this knowledge should be of value in determining preferential orientation; these planes indicate that in the cold-rolling of zinc into a ribbon, most of the crystals have their basal planes parallel to the plane of the ribbon. Twins probably occur on the same planes in cadmium as in zinc.

THE SOLIDUS LINE IN THE LEAD-ANTIMONY SYSTEM

By Earle E. Schumacher and Foster C. Nix, New York

An investigation of the solidus line above the solid solution field for the lead-antimony system by the quenching-test procedure has enabled the writers to determine three points between the melting point of pure lead and the end of the eutectic horizontal, and therefore to fix the precise location of this line, as shown in the partial equilibrium diagram.

PLASTIC DEFORMATION OF COARSE-GRAINED ZINC

By C. H. Mathewson and A. Phillips

It is not the primary purpose in this paper to discuss theories of plastic deformation but rather to describe a number of observations of what may be termed the crystallographic behavior under stress of single crystals grown by special annealing in strip zinc. These observations are also illustrated and theories advanced.

Re-elected Officers of the Institute of Metals Division

DR. P. D. MERICA
Chairman

DR. ZAY JEFFRIES
Vice-Chairman

W. M. CORSE
Secretary-Treasurer

PLASTIC DEFORMATION OF A ZINC CRYSTAL

By Dr. Samuel L. Hoyt, Schenectady, N. Y.

This paper gives a short account of plastic deformation as observed in single crystals of zinc, zinc having been selected for the experiments described herein because the phenomena are comparatively so simple and can be studied throughout such a wide range. It is hoped that the paper will serve to show the type of information which studies of single crystals afford and will contribute toward the solution of the general problem of metallic behavior.

NOTE ON THE DISTRIBUTION OF ENERGY IN WORKED METALS AND THE EFFECT OF PROCESS ANNEALING TEMPERATURE ON THE FINAL ANNEALING TEMPERATURE OF FINE COPPER WIRE

By Lyall Zickrick and R. S. Dean, Chicago, Ill.

Results are given of tests showing that a metal that has been cold-worked and reheated to a temperature below that of complete annealing will have the atoms with the higher energy recrystallized (that is, reduced to normal energy), and only atoms below a certain energy will remain. If this metal is again cold-worked, the peak in the number-energy distribution, curve will be displaced toward the regions of lower energies, that is, higher temperature of recrystallization.

NOTE ON THE RELATION OF ANNEALING TEMPERATURE TO CONDUCTIVITY OF COPPER WIRE

By J. C. Bradley, Waterbury, Conn.

Methods and results are given for tests with high-grade electrolytic copper wire, which showed that conductivity hard is considerably less than conductivity soft; maximum conductivity was attained after a 500° C. anneal; the decrease after that point is greater in copper that has been gassed.

SOME COMPARATIVE PROPERTIES OF TOUGH PITCH AND PHOSPHORIZED COPPER

By W. R. Webster, J. L. Christie and R. S. Pratt, Bridgeport, Conn.

The relative effects of cold-drawing on the two kinds of copper in question are presented. Percentage of elongation is not a proper measure of ductility. The slope and position of the contraction of area line is more significant, but neither or both are enough for comparative purposes. Ductility of standard copper alloys can be determined by drawing a specimen from the annealed condition through successively smaller cross-sectional dimensions, making tensile tests from corresponding samples and plotting the percentage contraction of area against the measure of the reduction effected by the successive drawings.

BERYLLIUM-COPPER ALLOYS

By W. H. Bassett, Waterbury, Conn.

The results are given of an investigation of the characteristics of beryllium-copper alloys and their behavior under hot-rolling or cold-working to establish the limits of composition of such alloys for these two methods of working.

The method of testing is described briefly and the structure diagram is given and the physical properties for alloys of varying content under different kinds of working and temper. Properties are also given for copper-beryllium ternary alloys with tin, cadmium or iron varying in content. Results of tests for resistance to corrosion showed that beryllium-copper alloys will be as resistant as pure copper itself but not more so.

CORROSION AND PHYSICAL PROPERTIES OF SOME ALLOYS OF ALUMINUM ZINC AND TIN

By N. O. Taylor, Iowa City, Ia.

The failure, by swelling, of several cast aluminum-zinc, spiral, pump rods, used to circulate water in a constant-temperature bath, brought up the question as to whether the presence of tin in varying quantities would have any appreciable influence in controlling this action.

Samples, covering the entire range of the ternary series of aluminum, zinc and tin alloys, were made up from good grades of the commercial metals. The materials were melted, at as low temperatures as possible, in graphite crucibles in a gas-fired crucible furnace. Graphite crucibles were used in preference to clay, to prevent the absorption of silicon by the aluminum, as found by previous workers.

These alloys were tested in various acids and alkalies, their loss of weight taken, and their physical properties; especially with regard to swelling and cracking.

EQUILIBRIUM RELATIONS IN ALUMINUM-MANGANESE ALLOYS OF HIGH PURITY

By E. H. Dix, Jr., and W. D. Keith, New Kensington, Pa.

Preparation of the alloys used, annealing, cooling and metallographic examination are described. The eutectic structure is discussed with a diagram of the aluminum end of the aluminum-manganese system and many photomicrographs. An explanation of the cause of the finely divided particles encountered is offered.

THE GROWTH OF METALLIC CRYSTALS

By Prof. Cecil H. Desdel, Sheffield University, England

This paper, read as The Annual Lecture of the Institute of Metals Division, described a part of the work of a committee of the Iron & Steel Institute of Great Britain, namely that part devoted to the growth of individual crystals of which a mass of cast metals is built up.. The work was done by analogy from observations of crystals in liquids. The report was divided into the following classifications: Observation of Growth; Arrangement of Ultimate Particles; Stages of Crystallization; Origin and Distribution of Duclei; Rate and Growth of Crystals; Surface Tension; Fountain of Metallic Crystals From Vapor; effect on Orientation of Molecule by Deposition on Single Crystal; Crystallization of Pure Metal from Molten State; Crystallization of an Ingot; Formation of Crystals and the Theory of Diffusion; Increased Growth at Angles—Convection Currents; Effect of Impurities Upon Crystalline Form; Crystallization of Alloys.

DEFORMATION OF AN ALUMINUM ALLOY BY CONSTANT LOAD

By C. B. Sadtler and J. L. Gregg, Chicago, Ill.

The authors have offered the data in this paper in the belief that, from a scientific point of view, considerable interest attaches to the behavior of various types of material under constant stresses, and it is hoped that with further study along these lines valuable information can be gained as to the more fundamental internal mechanical reactions that occur in metallic materials which are subjected to stresses. The data available at the present time seem rather meager as a basis for constructing a helpful theory. Those who are inclined to construct theory based on the assumption of the existence of appreciable quantities of amorphous metals or alloys in the solid state may possibly attach significance to the limited resemblance which some of our "deformable" material bears to amorphous materials.

STILL CASTING OF METALS

By P. H. G. Durville, Paris, France

Any kind of an aluminum alloy which is to be transformed into rolled products, or used directly as molded products, must be poured with a minimum of agitation. This has been accomplished by the new method technically known in France as "coulee tranquille," i. e. "still casting process."

There are two methods of pouring: (1) the tilting process—pouring by tilting; and (2) bottom-pouring or ascendant pouring.

Tilting Process

The tilting method of still pouring is characterized by rigid union of the ingot mold and the ladle. The melted metal is first poured into the ladle and then cleaned of any dirt which has been produced by this pouring. The mass of melted metal is then transferred to the ingot mold with a minimum of disturbance by tilting the whole system on a vertical plane. This process has been successfully developed in France for pouring aluminum bronzes and is now being introduced into this country.

BOTTOM-POURING

In bottom-casting the metal is introduced into the mold with a minimum of agitation by means of a gate which is built up to its full height during the pouring operation; at all times it is at a very short height of fall, which prevents mixing in the dross caused by the wrinkles of alumina film. This method is even better for some purposes than the direct pouring with strainer gates, because the pouring can be done very slowly, thus reducing shrinkage to a minimum.

NOTES ON THE ATOMIC BEHAVIOR OF HARDENABLE COPPER ALLOYS

By Dr. E. C. Bain, New York

The investigation shows that very perfect crystallinity exists in the solid solutions prepared at high temperature to contain as much dissolved silicide as possible.

The hardening by drawing at a temperature to initiate precipitation of excess silicon and metal produces a remarkable change in the solid solution. The old perfection of crystallinity in the solid solution is destroyed and the new atomic spacings are of variable magnitude even in one grain, and a condition in a measure resembling that found in martensite is observed. Were no particles whatever precipitated by the drawing action, still ample causes for hardness would be in evidence in the solid solution alone. The lack of plane continuity in the crystal grains would oppose slip in a very effective manner.

COPPER ALLOY SYSTEMS WITH VARIABLE ALPHA RANGE AND THEIR USE IN HARDENING COPPER

By M. J. Corson, Long Island City, N. Y.

New systems of copper aloys were described including copper-chromium; copper-cobalt; copper-silicon; copper-nickel-silicon; copper-cobalt-silicon; copper-chromium-silicon; copper-iron-silicon.

Studies were made of the electrical conductivity changes on quenching and annealing; the hardness changes on quenching and heat-aging; microstructural examination for undissolved crystalline particles in quenched specimens; microstructural examinations for the darkening of the grains previously quenched.

These systems show the unusual property of having increased power of dissolving constituents at higher temperatures and precipitating them out again at lower temperatures; this results in hardening by the precipitated particles which act as keys.

The above systems were described in detail and illustrated with charts and equilibrium diagrams.

Unusual results were obtained with some of the alloys giving extraordinarily high tensile strength and hardness, and also very good electrical conductivity. These alloys have great possibilities for use in manufactured products such as rod, wire, tubing, sheets, etc.

THORIA AND TUNGSTEN

By Zay Jeffries and P. P. Tarasov, Cleveland, Ohio

When thoria (Tho_2) is added to tungsen and the mixture heated to high temperatures, some thoria is decomposed, but not more than 0.01 per cent. When such a mixture of tungsten and thoria is mechanically worked hot, the thoria is permanently deformed. In reducing the working temperature each thoria particle breaks up into smaller particles so disposed as to affect the grain structure of the tungsten after recrystallization. These smaller particles exhibit growth on heating to a high temperature, some particles disappearing and others becoming larger.

GRAIN-BOUNDARY PHENOMENA IN TUNGSTEN FILAMENTS

By E. S. Davenport, Bloomfield, N. J.

Certain metallic filaments when subjected to high temperatures, either in vacuum or in protective or reducing atmospheres, develop small pits, or voids, in the grain boundaries. These pits are generally disconnected and more or less spherical. Tht pits have been observed in samples of tungsten, molybdenum and a few other refractory metal filaments made from the metal powders. The previous chemical and thermal treatment of the metals, as well as the atmosphere surrounding the filament at incandescence, influence the readiness with which the intergranular pits develop. The size of the pits increases with time and temperature at incandescence.

A STUDY OF THE 470° C. TRANSITION POINT IN CAST 60:40 BRASS

By Frances Hurd Clark, Cambridge, Mass.

Studies of the change in structure of copper-zinc alloys around 570° C. have hitherto been made with rolled and annealed stock, reheating the quenched specimens. The question of the cast condition is discussed in this paper. It was desired to learn if twinning would take place on reheating at 470° C. with material that had not been worked as this would give a knowledge of the nature of the quenching operation and the strains set up in the material as it cooled rapidly from the beta range down through the alpha plus beta range.

THE TARNISH RESISTANCE AND SOME PHYSICAL PROPERTIES OF SILVER ALLOYS

By Louis Jordan, L. H. Grennell and H. K. Herschman, Washington, D. C.

As one phase of the technical research undertaken at the direction of the U. S. Senate Commission on Gold and Silver Inquiry, with a view to increasing the uses of silver, a wide variety of silver alloys were prepared.

Alloys of silver with cadmium or zinc were the most tarnish resistant of the binary alloys. These alloys were readily rolled to sheets but were of the lowest tensile strength of all the workable binary alloys.

Antimony and tin were rather effective in strengthening silver in binary combinations and at the same time showed some tendency to increase the tarnish resistance of silver, although not to so great a degree as cadmium or zinc. The addition of either antimony or tin, or of both antimony and tin to a silver-zinc alloy, the sum of all alloying metals not exceeding 7.5 per cent. in order to give alloys of sterling fineness, produced workable alloys of marked tarnish resistance and of greater strength than any of the tarnish-resistant binary alloys.

Alloys of silver with 15 or 20 per cent. of zinc or cadmium and 20 per cent. of gold were very easily worked, possessed strength and hardness values more nearly comparable to copper-silver of sterling fineness than any of the other alloys prepared, and at the same time were very tarnish-resistant. The debasement of silver by the addition of 15 to 20 per cent. of base metal was more than offset in these alloys by the high gold content.

An alloy of silver with 20 per cent. of zinc containing just sufficient gold to make the intrinsic value of the alloy equal to that of ordinary sterling silver (copper-silver), was resistant to about the same degree as the silver-zinc or silver-cadmium alloys high in gold.

None of the alloys made and tested in this investigation can be described as "non-tarnishing." All could be tarnished under sufficiently severe conditions. Many of them, however, were distinctly more resistant to laboratory sulfur-tarnish tests than ordinary sterling silver.

APPLICATION OF MICROTOME METHODS TO THE PREPARATION OF SOFT METALS FOR MICROSCOPIC EXAMINATION

Francis F. Lucas, New York, N. Y.

The microtome method of sectioning can be applied successfully to the preparation of soft metals for microscopic examination. The knife must be honed and stropped so that the cutting edge will be as free as possible from serrations, feather edge, etc. If the knife will cut sections 2 microns in thickness the metal surface will etch satisfactorily. The etch must be deep enough to remove surface cold working; otherwise erroneous conclusions may be drawn.

The phenomena of widened grain boundary areas and aging out of antimony were not fully revealed and understood until the present method for preparing specimens was developed.

PLASTIC DEFORMATION OF METALS

by J. T. Norton and B. E. Warren, Cambridge, Mass.

The nature and results of plastic deformation in the cold working of metals are discussed in this paper. A lattice theory of the solid state of metals is considered and a theory of plastic deformation is developed on the idea of slip in definite directions along certain crystallographic planes. Such slip results in a definite preferred orientation of the crystal grains, which may be verified by X-ray examination.

Core Baking With Electric Heat

A Description of Core Making Covering Sands, Binders and Electric Baking. Serial Report of the Power Committee, National Electric Light Association.

It is obvious that the surfaces on a casting formed by cores should be as good as those formed by the sand comprising the mold proper. This fact is not generally recognized. Baked cores are frequently filed to make them fit, and no attempt is made to produce accurate holes for machine shop reaming. It is perfectly possible to turn out castings true to size within limits of a few hundredths of an inch. This is done in many specialty shops, such as those manufacturing automobile engines, radiators, pipe fittings, etc. In these cases the core is one of the most important parts, for upon its accuracy depends the thickness of metal which is afterward to withstand certain considerable pressures.

Where smooth surfaces are required, as in the casting of brass and bronze, it has been found that clean cores without a deposit of smoke, ashes or other products materially reduce the cost of buffing or smoothing up of the casting. This is a large item, especially in the case of the finer kinds of casting.

CORE SANDS

Silica forms the principal heat resisting element in all core sands. As it forms also frequently more than 90 per cent of the weight of the sand, it is naturally the principal ingredient of all cores. The individual grains of sand in any core must be bound together by some material which will hold them tightly. At the same time the core must be sufficiently porous to vent freely, which means a considerable percentage of voids in the sand.

The choice of a core sand depends somewhat upon the metal to be cast. Brass and bronze allows melt at a lower temperature than iron, and thus remain fluid for a longer time in contact with a core. In addition, they are less viscous when fluid, and will flow into sharp corners which iron would not penetrate. Thus, a core which would be amply dense for iron or aluminum may be so open when used with brass or bronze that the metal will penetrate and make a poor casting. An iron containing much phosphorus is somewhat similar to brass in this respect.

CORE BINDERS

Linseed oil of the proper grade is believed to be the strongest and most efficient binder when dealing with clean silica grains. Its effectiveness is destroyed, however, if there is clay in the sand. The material must be so thoroughly mixed with the sand that every grain is uniformly covered with the oil or an emulsion of oil and water. The great thing in making core sand is to rub the binder intimately all over every particle of the sand. The two must be incorporated into a homogeneous mass composed as nearly as may be of uniform-sized particles. The mere sifting or riddling together of the ingredients is not real mixing, and is neither efficient nor economical. All oil sand mixtures must be tempered with water.

The heat of the core oven evaporates moisture in the sand, and where there is adequate ventilation drives it completely off. As the moisture passes outwards from the interior of the oil-bound core the high viscosity of the oil leaves it behind, where it coats uniformly each grain of sand. Capillary attraction tends to accumulate excessive oil at the contact points of the sand grains. The oil finally dries at these points. Most of the other drying oils contain less body than linseed and hence do not give so firm a bonding mass.

Flour or dextrine paste—another useful core binder, forms small masses of grains, which dry on the face of the sand grains. These do not flow to the contact points, as does oil, so that only those portions which rest naturally at contact points act efficiently as binders. It is believed that less than 40 per cent of the material acts efficiently in this way.

Resin and pitch bond sand much as oil does, but less efficiently. They melt in the heat of the core oven and flow over or between the grains, collecting to a certain extent at the points of contact. They are not adversely affected by clay, though they gain nothing from it. Such a core is easily cleaned from the casting because the carbon in the resin or pitch is burned out, thus disintegrating the core.

Glutrin acts much like oil, but in sand free from clay, it tends to be driven outward with the moisture. This gives the core a very hard skin and soft interior, with resultant loss in strength.

Molasses has to be handled with great care. If the

FIG. 1—ELECTRICALLY HEATED CORE-BAKE OVEN—CONNECTED LOAD 5 KW.

core is taken from the oven at the critical point when the molasses has reached the consistency of ordinary molasses candy and hardened into thin plates connecting the sand grains, the core will be strong. If taken out before this period is reached or if left in the oven a little too long, allowing the carbon to become oxidized, the strength is very problematical. With molasses, therefore, results cannot be expected to be uniform.

Most attempts to mix different types of binders have been failures. Oil and flour practically kill each other off so far as their value to the core maker is concerned. Oil and a natural clay bond tend to neutralize each other. It is thus evident that once a satisfactory binder is obtained, little can be gained by experimenting, looking to its improvement by a combination with other binders.

STRENGTH OF CORES

Certain binders can be baked at a high temperature so as to expel most of the volatile hydrocarbons and leave little but solid carbon as the binder. Where this is done an excess of binding material must be used to make up for the sacrifice of the binding power of the hydrocarbon

compounds. If the baking continues until all the volatile hydrocarbons are driven out, the volume of the binder is so changed that cracks or checks will be formed in the core. The ideal binder contains enough hydrocarbons to give a strong core, but not enough to give off gases during pouring which are obnoxious to the workmen.

After the liquid metal in contact with the core has burned out the hydrocarbon compounds, there should still be enough binding properties left to act until the skin of metal next the core becomes strong enough to resist the tendency of the molt mass to cut the core. Where metal must flow through or cover a core, bonds of a carbonaceous nature only can rarely prevent cutting or washing. Clay or some similar refractory bond has to be used. Sometimes the core surface is protected by silica wash or clay and blacking wash. In many cases this condition makes it necessary to use more binder than would be demand by strength alone.

PREPARATION OF CORE MIXTURES

All core sand should be dried before the binding material is added. When mixing the mixture proportions should be determined after the sand is dried, so that uniformity can always be secured. If the measurements are made with wet sand, whether by weight or by volume, the proportion of binder to net sand is thereby increased, but with an unnecessary addition to the expense.

The character of the binder determines largely the amount of work which can be turned out in a given time. If the material sticks to the core box, it takes longer to get results. In many cases where the sticking comes from too strong a core mixture, the trouble disappears as soon as the proportion of the binder is reduced.

DRYING THE CORE

The baking or drying of a core is a complex process, depending upon the character of the sands and the nature of the binders used. The first operation in either the starchy or or the resinous cores is to drive out the water. The second part of the process is the baking or melting. When the water is driven off, the oven should have ample ventilation so that the steam may readily escape. During the baking, the free circulation of air is less important.

FIG. 2—ELECTRIC CORE-BAKE OVEN—HEATING CAPACITY 50 KW. INSIDE DIMENSIONS 7 FT. 6 IN. HIGH, 7 FT. WIDE AND 7 FT. 10 IN. DEEP.

With flour, starch, or dextrine, the moisture is first driven out and then the compound is baked as in bread baking. To develop the greatest strength the material must not be charred, but should be carried to the condition of ordinary bread crust. The best temperature is from 350 to 375 deg. fahr. Under no circumstances should it exceed 400 deg. fahr. A flour core taken from the oven at maximum strength contains moisture combined in the binder, which gives off much smoke at pouring.

With resin or pitch cores the material should be heated to a point where the resin or pitch will flow and unite the grains of the sand. This is again between 350 and 400 deg. fahr. As practically all black core compounds contain a considerable percentage of dextrine, these cores must not be heated above 410 deg. fahr., otherwise the

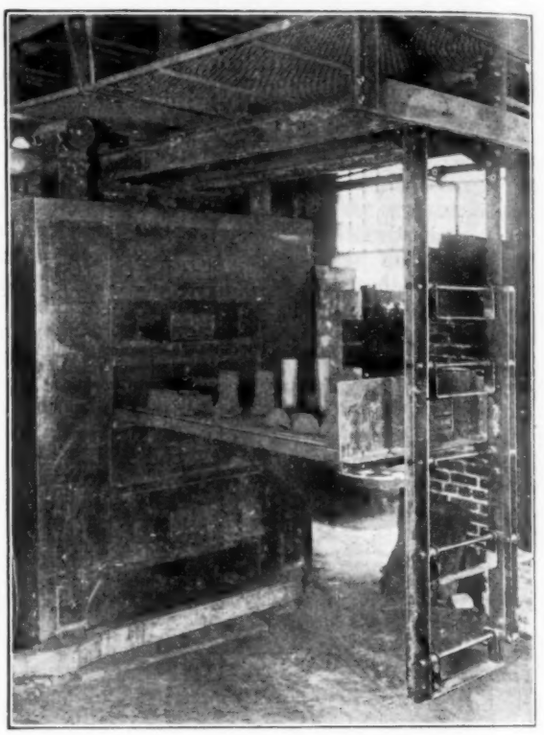


FIG. 3—ELECTRIC CORE-BAKE OVEN—FOR BAKING SMALL CORES AT 400 DEG. FAHR. INSIDE DIMENSIONS 7 FT. 6 IN. HIGH, 5 FT. 8 IN. WIDE, 6 FT. 8 IN. DEEP.

dextrine will be burned out or some of the resin oils distilled off, and the material lose in strength.

CIRCULATION OF AIR

With oil sand cores a good circulation of air is required throughout the process. The first part consists in driving off the moisture, the second is the oxidation of the oil. Both need plenty of air. If the circulation is imperfect the oil may remain moist for a long time, even through the temperature employed may be much above that otherwise necessary. As very few of the binding oils burn at less than 500 deg. fahr. the oven can be run at a higher temperature than with starchy or resinous binders. At the same time, somewhat more uniform results are obtained at about 400 deg. fahr.

UNIFORM TEMPERATURES

One great difficulty in the baking of cores and molds with coal or coke, is lack of uniform temperature in the different parts of the oven. This is almost inseparable from the use of a coal or coke fired oven, one portion being too cold for effective work, while the section near the fire may be so hot as to burn the cores. For this reason good distribution of heat all over the oven is necessary for the best work.

By electrically heated ovens, automatically controlled and a proper ventilation, it is possible to eliminate almost completely the loss, which is from 10 or 30 or 40 per cent of the cores where less careful supervision is the rule. This benefit will come, not only in the cores themselves but in the castings, hundreds of which are spoiled every week because of being poured with imperfect cores.

This article will be concluded in an early issue.—Ed.

The Fundamentals of Brass Foundry Practice

A Description of the Basic Laws Which Control the Melting and Casting of Metals and Their Application to Practical Foundry Operations*—Part 8

Written for The Metal Industry by R. R. CLARKE, Foundry Superintendent

RADIATION AND CONCRETION

As previously noted the main avenue of escape consist in changing physical properties, avoiding too much of "newness" or rawness in the metal and watching critically the pouring temperature.

Radiation, relative mass and temperature are the great considerations in controlling congealing rates in different casting sections. In this connection the practice of chilling casting parts awaits consideration. The author does not incline greatly to this practice. His method is always to feed rather than chill wherever possible. Too often under the crust surface of a chilled section the metal is unsatisfactory. Often, also the defect eliminated in one part of the casting is only driven to another part and there concealed. In aluminum and its alloys we use the surface chill frequently, but in brass and bronze, wherever chilling at all, we resort to wires or rods of identical metal inserted in the mold. Even then we often doubt the ultimate worth of the thing. A heavy casting section amply fed will sustain the pull of a lighter and adjoining part without damage, and this appears a better remedy than chilling. To avoid final effects of a pull between them, when a light section joins a heavy section in a casting, gate or feed heavily on the heavy section close to the union of the two. The feed will then replenish as the lighter section cools and pulls.

From a standpoint of reason, chilling as a means of completely overcoming shrinkage will not bear analysis.

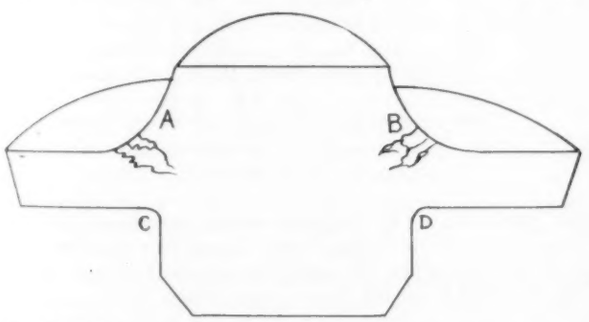


Fig. 27—Shrink cracks developed at points A and B. Chills on the surface only drove shrinkage effects inward and beyond surface vision. To overcome, chills were used at A-B-C and D and a riser of volume placed over the cope of the casting. The chills drove the zone of final concretion well under the riser and solid castings throughout resulted.

We might study it in connection with Figure 27 representing castings that gave trouble from shrink cracks at points "A" and "B". Chills were placed around the mold at these localities and the shrink cracks disappeared, seemingly. But in machining the centre of the flange they showed up. The chill had simply merely taken care of the situation in the chill's inner hole vicinity. Now, by analysis, it takes so much metal to fill the mold whether chilled or unchilled, and so much varying loss will occur by shrinkage regardless of congealing rate. The chill cannot suspend contraction nor eliminate loss. Neither can it replenish loss. About the most it can do is to change the localities (from the surface) of the effects of final loss. Moving these localities from the surface inward does not and cannot eliminate these losses altogether. The plastic centre of concretion has still to be taken care of and over that the chill has no jurisdiction; it lies beyond it. In the case of Fig. 27, the castings were particular and to get them satisfactory chills were used at points A, B, C and D and a riser of volume placed over the top of the casting. This riser took care of the centre of mass and the chills drove the bounding lines of the mass centre directly under the riser supply. From this it is obvious that if a casting must be chilled, against shrinkage, the chilling should be studied and worked out according to the law and the evidence.

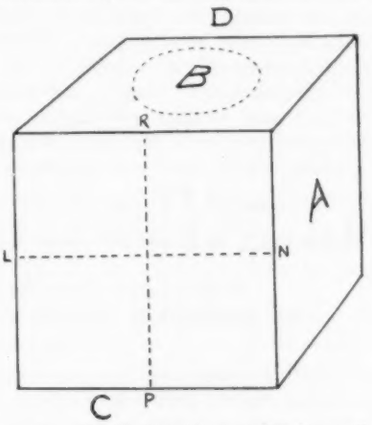


FIG. 28—If the cube be chilled on all 6 surfaces it will set more quickly to a center of concretion near the center of mass and shrink less than if unchilled, due to the decreased volume of liquid metal at pouring finish, brought about by the chill setting a part of the metal while pouring. If surface C (bottom surface) only be chilled, concretion will quicken upwards and come to an ultimate zone above the center line LN. If only surface B be chilled, a crust of metal will form probably with a cavity underneath it and leading down to a zone of final concretion below center line LN. If only surface A be chilled, the zone of concretion will locate beyond center line RP. If in chilling all six surfaces a riser of volume be placed well over the vertical center of concretion, as per dotted line, it will feed solid the zone of ultimate concretion.

To illustrate further, if chills be placed over or near the highest surface of a casting, the casting may appear perfectly solid there yet in reality have merely a crust of metal over a cavity. It would be better often to chill farther down in the mold, over or near the drag surfaces thus moving the zone of final concretion farther up in the casting to be taken care of by a feeding riser supply.

This merely reiterates the principle already enunciated, that the closer the feeding supply lies to the centre of ultimate concretion the greater the advantage. However, in all cases of chilling castings it must be remembered that it only hastens concretion and does not deprive contraction of its toll, nor persuade physical law to suspend. Its fundamental weakness is the basic fact that it neither annuls shrinkage nor compensates the loss thereof.

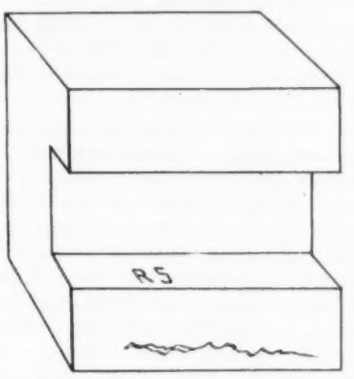


FIG. 29—If the cube be cored out and the inside surface RS be chilled, concretion will quicken from inside outward and locate the final zone closer the outside surface than if unchilled. Concretion from outside inward will meet that from inside outward and establish the vicinity of loss. Chilling therefore, only reduces final loss and drives its localizing areas farther from the surface chilled.

Summing up we note the following in connection with chilling castings:

* All rights reserved. This series will be collected and published in book form. Parts 1, 2, 3, 4, 5, 6 and 7 were published in our issues of July, August, September, October, November, 1926, January and February, 1927.

Chilling a casting around its bounding side surfaces hastens concretion from outside inward and localizes shrinkage loss closer to centres of concretion.

Chilling a casting on its cope surface hastens concretion downward and localizes loss beneath a crust of cope metal.

Chilling a casting on its drag or bottom surfaces hastens concretion upward and throws the zone of final concretion farther up in the casting.

Chilling a casting from an inside surface hastens concretion from inside outward to meet concretion from outside inward and establish the plane or zone of final concretion nearer the outside surface.

In bulk and in absorption powers chills should meet the requirements of the volume of the metal chilled.

Chills should fit snugly and neatly to the contour of the pattern part chilled and should be protected against the action of the metal by some refractory casting.

Metal chills get out of shape easily and should be watched and replaced when in too bad a condition. The closer the effect of a chill can proceed to the zone of final concretion, the better the chance of feeding that zone solid with a riser supply.

Aside from metal chills, a chill of hard carbon is frequently used to advantage in that it reduces the molten casting metal less, absorbs heat rapidly and leaves a very satisfactory surface on the casting.

FIG. 30—A FAMILIAR CONDITION UNDER A CHILLED COPE SURFACE.

This series will be continued in an early issue.—Ed.

Making a Form for Crucible Tongs

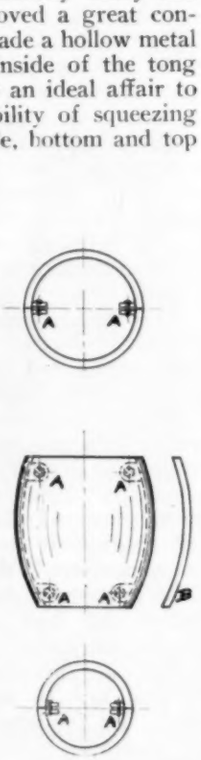
Written for The Metal Industry
by JOSEPH P. McGINNIS, Foundryman

Crucible makers and users of crucibles agree that tongs that fit properly will help prolong the life of a crucible.

The methods used among brass founders to keep their tongs in shape vary greatly. In many cases, where a blacksmith shop is near, the tongs and crucibles are taken to the shop and the blacksmith tries to fit the tongs to the crucible, and a more or less passable fit is made. While this sort of fitting is better than no fitting at all, it cannot be recommended.

I have in mind a certain foundry where a solid metal form, giving the exact curve, was used. This "tong former," being solid, was naturally extremely heavy and cumbersome, but in spite of this it proved a great convenience for those days. Since then I made a hollow metal crucible tong form with lugs on the inside of the tong shaper, bolted together. This was just an ideal affair to keep tongs in shape and reduce possibility of squeezing the crucible. The illustrations give side, bottom and top view of the crucible tong former.

As the molding was a little out of the ordinary foundry job it may be of interest to some foundrymen to know how I made it. After standing crucible on floor, bottom side up and making a line across center of bottom and along each side, I bedded it in, using an upset under the drag part of flask for convenience in molding, being careful to have line on crucible even with joint of flask. When parting was made along the sides, I removed sand from ends of crucible and took the crucible out of the sand. I had made some strips of the thickness as the casting was to be and the shape of the outside of the crucible (shown at B). These were placed in the mold and partings made at the ends. Cope was then put on, the lugs being put in place while it was being rammed up. After cope was lifted off the lugs were drawn out, strips removed, mold finished, closed and poured.

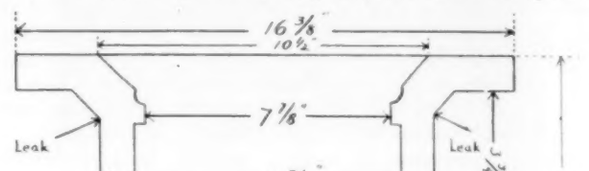


CRUCIBLE TONG FORMER

Leaky Brass Casting

Written for The Metal Industry
by WILLIAM J. REARDON, Foundry Editor

Q.—Enclosed you will find a drawing of a dry pipe sleeve for a locomotive which we are trying to cast, but without success. These castings have to stand 315 pounds water pressure. The castings when machined are just as clean as could be desired; not a spot on them either inside or out, but when put under pressure they leak underneath the flange on the heavy part which I have marked. We have been running them from the bottom with four large risers on the top. I tried copper 87, tin 7, zinc 3, lead 3, and 1 lb. shot nickel to every hundred pounds and could not get them solid. The castings weigh 160 lbs. Then I tried another mixture, copper 85, tin 3, zinc 7, lead 5, with 2 oz. phosphor tin to the hundred pounds, but without success.



LEAKY BRASS CASTING

A.—Your trouble we believe is due to segregation. The metal stays fluid under the flanges and is drawn away by the lighter parts of the casting. To overcome this difficulty it is necessary to have the metal set evenly so this segregation will not take place. We suggest you change your mixture to 82 copper, 7 lead, 7 zinc, 3 tin, and 1 lb. nickel shot, composed of 66⅔ nickel and 33⅓ tin. Also make a chill by pouring plaster on pattern where the casting leaks as marked. Make the plaster about 1¼ in. thick and cast from the plaster pattern in an alloy of 93 copper, 5 tin, 2 zinc. Place this chill on the pattern and ram up in the mold. This chill will not blow and will set the metal in about the same time as the balance of the casting. It will stop the segregation; also your trouble due to leakage.

The Production and Refining of Remelted Zinc

A Description of Modern Practice in Producing Good Zinc from Scrap—Conclusion*

Written for The Metal Industry by EDMUND R. THEWS, Metallurgist

REMOVING TAR

Zinc scrap strongly contaminated with tar, as for instance pieces of cables, etc., should under no circumstances be charged into the melting pots directly since the heat of combustion generated by the burning of the large amounts of tar will cause the oxidation of most of the thin zinc wires contained as well as the surface of the metallic bath. If such material in the uncleaned condition is accepted at all, it should first be subjected to a preparatory treatment by placing upon inclined iron plates heated from below, melting off most of the tar present.

MELTING AND REFINING PRACTICE

The production of ordinary remelted zinc is quite a simple proposition, its success depending upon the skill and dependability of the operators exclusively. After a sufficiently deep bath of metal has been formed by melting down about a dozen slabs of remelted zinc, charging is commenced. The sheets are held down into the bath until melted. The heavy clouds of organic vapors generated must, as has been said above, be taken care of by sufficiently large hoods and flue pipes; under no circumstances, however, should they be ignited, as is nearly always done in order to destroy the ugly odor of the vapors and to cause them to be drawn off more rapidly. Burning vapors will greatly increase the loss of zinc by oxidation. Whenever the vapors are ignited by the heat of the metallic bath, charging should be interrupted until the fire has burned out. The more tar and other inorganic impurities present the lower should be the working temperature of the melting pot. The normal temperatures, 950-1000°F, are best recognized in practical work by a dark red glow of the free surface of the zinc bath if the hood is almost closed.

The ashes accumulating on the surface of the metal must be taken off whenever a certain thickness, that is to say, about ½ in. has been reached, since besides rendering more difficult the charging of fresh materials, heavy layers of ashes will retain large amounts of metallic zinc. In common melting practice the zinc ashes are nearly always treated with ammonium chloride before being taken off in order to remove all the metallic zinc contained. This is to be condemned, however, since the usefuless of the ashes for many purposes and their market value are considerably decreased.

The ashes should be passed over a mechanical shaking sieve, good commercial zinc ashes being obtained, whilst the zinc beads are returned to the melting pot. The use of ball mills for separating metal and ashes cannot be recommended, since a large percentage of the brittle zinc beads will be crushed and passed into the ashes, the trade value of which is not sufficiently increased thereby to offset the loss of metallic zinc sustained.

REMOVING LEAD

After removing the ashes, the metallic bath should be left to stand quietly for about 5 minutes in order to assure of sufficient separation of lead. If the temperature of the metal is still too high to warrant good results—as is often the case with single pot plants—some zinc slabs are added to reduce the temperature to about 900°F. However, there can be no overheating, if the above indicated working scheme is adopted, that is to say, if the pots are not entirely emptied and filled at each charge but if about 20 to 25 slabs are produced each time. The regularly recurring short intervals of charging and pouring periods prevent effectively the development of radical temperature changes and tend to produce a high grade remelted zinc of comparatively low lead content. The pots are completely emptied twice a week. The lower portion of the charge containing the separated lead is ladled out and reserved until enough has accumulated to fill a deep pot, where it is melted and left to stand quietly at a temperature closely above the freezing point for 6-8 hours (over Sunday). The upper portion consisting of good quality remelted zinc is then removed, whilst the zinc-lead mixture remaining is either dezincified in a reverberatory or distillation furnace, or if these are not available, it is sold.

A very good method of treating the zinc-lead mixture is to melt it down in a melting pot provided with a bottom tap. The material is first left to stand quietly several hours, the temperature is then permitted to fall slowly until the upper layer of zinc has completely hardened. The lower portion, possessing a much lower freezing point is then tapped.

The working methods applicable to the production of remelted zinc in the twin pot plant is self-evident. The raw material is charged into the first pot of the system which, as Figure 2 shows, is slightly raised above the second. A large part of the lead contents settle down to the bottom whilst the purified zinc flows over into the second pot whence it is ladled out at regular intervals. Here, too, but a comparatively small amount of zinc should be ladled out each time so as to promote the settling of the lead.

If the pots are made of good quality cast iron or, better, steel, no special refining processes are necessary, since the specifications set up for the contents of tin, iron, and copper are easily fulfilled if fairly good and well cleaned scrap is being used and the melting process is carried through correctly.

Considerably more difficulties are encountered in the production of guaranteed zinc containing at least 98 per cent zinc, the impurities consisting mainly of lead with small percentages of copper and tin and less than 0.10 per cent of iron. Although as a matter of course, it is easy enough to produce a first class zinc from new and bright sheet zinc scrap, free of soldering seams, economical considerations demand the use of as large a percentage of the ordinary and cheaper zinc scrap as possible.

REMOVING IRON

Apart from the separation of lead which with correct working methods takes care of itself, particular attention must be paid to the iron, which, besides lowering the mechanical properties of the finished product, tends to deteriorate strongly the resistance against corrosive influences. The original iron contents of the zinc scrap is materially increased by absorption of iron from the iron material mixed with the scrap as well as from the walls of the pots. All efforts to reduce the iron contents must therefore be directed towards:

* Part 1 was published in our issue for February, 1927.

(1) reducing the absorption of iron by the fused zinc,
(2) removing as much of the iron absorbed as possible.

The first problem has already been discussed in detail. By using steel pots of good composition, washing the walls with milk of lime or with a lime-graphite mixture, and maintaining sufficiently low working temperatures, absorpton of iron by the fused zinc is reduced to a minimum. In fact, by conscientiously observing these rules the iron contents may without further treatment of the zinc be kept as low as 0.10 per cent, provided the scrap used did not contain too much iron in the beginning.

A large amount of the iron absorbed may be removed by a sulphurizing treatment. Quantitative removal of the iron by this or any other method is economically impossible. In common melting practice this treatment is carried out by throwing a few pieces of sulphur sticks onto the surface of the metal, stirring vigorously so as to allow as large an amount of metal as possible to get into contact with the melted sulphur. This primitive method cannot, of course, assure the intimate contact between zinc and sulphur necessary to remove sufficient amounts of iron as sulphide.

Really satisfactory results can only be obtained if the sulphur is placed into a perforated iron box and brought down to the bottom of the pot. The sulphur vapors formed rise up through the metallic bath, stirring up the metal vigorously and permitting intimate contact of the gaseous sulphur with all parts of the zinc. The implement used for this purpose consists of a cylindrical or square iron box about 8 in. long and 4 in. square (diameter) and is provided with a perforated lid. The box is welded—lid downward—to an iron rod about 10 ft. long.

It should here be pointed out that at the temperature of the process sulphur vapors possess an exceedingly corrosive influence on the iron or steel walls of the pots, particularly of the bottom portions, the hottest and most exposed parts of the pots. In order to prevent such contact as much as possible, the box is not welded to the end of the rod but about 6-8 in. above, so the rod may be supported on the bottom of the pots without the vapors touching the bottom.

REMOVING TIN

However, the chemical influence of steam may be used to greatest advantage in removing a comparatively large part of the tin contained in remelted zinc. For this reason a steaming apparatus should be attached to the second pot of the twin pot system. The use of boiler steam for this purpose should under no circumstances be attempted, since even with superheated steam condensed water may be formed in the long and thin conduction pipes, which if entering the metallic bath will cause powerful explosion.

The following arrangement will eliminate this danger besides being absolutely independent of accessories and affording the cheapest source of steam possible.

One end of an ordinary water pipe is bent so as to fit the side walls of the melting pot, reaching down to the center of the bottom, whilst the other end is connected with the water system. The connection is secured with two valves, one of which is detachable and is kept in custody by the foreman. If steam is needed, the detachable valve is closed tightly, the fixed valve opened fully, and the detachable valve carefully opened far enough to cause vigorous boiling of the metal. It is then removed. The fixed valve is now closed until the metal surface is just "simmering." The principle of this steaming arrangement is plain. The two valves are opened just far enough to allow a few drops of water to enter the steaming pipe at a time, where they are evaporated at once, entering the metallic bath in form of steam if the water pressure is sufficiently high.

Steaming and sulphurizing of the zinc takes place simultaneously, the former being kept up about 3 minutes longer than the latter in order to remove all traces of sulphur possibly remaining behind in the zinc, and to remove the slightly yellowish color often appearing in sulphurized remelted zinc. The reason for this peculiar fact has not yet been determined. However, the author has found that the bronze tint will almost invariably appear upon treating remelted zinc with sulphur if electrolytically bronzed cast zinc has been used in the charge. At any rate, the constituents which may be active in producing this result are present in so small quantities as to defy detection.

REMOVING DISCOLORIZATION

If steaming does not remove the coloration, as is sometimes the case, an absolutely sure remedy is the following:

About ¼ pound of aluminum is added for each ton of zinc present. The metal is then stirred around for about 3 minutes in order to assure of the melting and solution of all the aluminum added whilst, finally, steam is passed through for 3 minutes. The aluminum introduced, 0.012 per cent, is absolutely harmless, but will remove all color whatsoever and give to the slabs the perfect white color desired by the trade and the arts.

Brass Forging

Q.—Can you furnish us with information about brass forgings and the cost of same compared to brass castings or screw machine parts manufactured from brass rod; also if hot pressed forgings are the same and methods followed in their manufacture.

A.—The main reasons for forgings replacing brass castings are as follows. Forgings average 50,000 per sq. inch tensile strength against castings 20,000 to 30,000 per sq. inch. They are made of Virgin metal. It is impossible to make a porous forging; hence you never find a leaky forging. Forgings contain no sand to dull or wear tools and consequently the life of tools used on forgings is many times longer than that of tools used on sand castings. With forgings uniform parts are assured at a fixed price for every lot. With castings the grade of material varies and you are never sure of the cost. Considerable saving can be shown on brass forgings from parts manufactured from brass rod where 30 per cent or more is turned into chips. If a part has a flange or hub on each side it will always prove a saving to forge it.

Take the case of piano caster rollers made of bar stock. The bar stock cost $150 for a thousand parts. If forged the material costs approximately $70 per thousand. The majority of parts made in presses are called hot pressed parts instead of forgings. In hot pressing slugs are generally used. These slugs are sawed from bars of the diameter found to fill the cavity best and of a length to suit the weight of the finished part plus a small amount for the flash.

It is good practice to check the slugs by weight before hot pressing, knock-outs are provided to eject the forgings from the die cavity. Operators sometimes oil the dies with wax and a mixture of oil and graphite. Care should be taken that an excess of lubricant is not used as it is detrimental to the life of the dies. The dies often crack from the excessive use of oil.—P. W. Blair.

An Interesting Welding Job

Church Bell Restored by Electric Arc Welding

After a silence of 40 years, a 922-pound bell in the First Unitarian Church of Taunton, Mass., was repaired by electric arc welding and run for the first time on Sunday, February 12, 1927. The church was founded in 1637 and the bell was cast in 1804 by George Holbrook, who learned his trade as an apprentice to Paul Revere. The bell was found to be cracked in 1886 and since that time has been silent.

FIG. 1—THE CRACKED BELL

For the past two years there has been agitation to repair the bell. The General Electric plant at Lynn was called upon for assistance, specimens of the bell metal were taken and an investigation of the crack made. The bell is 34 inches in diameter at the mouth, 18 inches in diameter at the top and 26 inches high. The crack was 17 inches long and had a section varying from one inch in thickness to 2⅝ inches maximum near the outer edge. The bell metal was found to contain 83 per cent copper and 17 per cent tin.

After the crack had been prepared for welding, a standard motor generator, constant energy type of welder was employed in the actual welding, an electric power line having been installed in the belfry, 56 feet from the ground. Power lines were run down from the belfry to the welding outfit on the ground, and the welding leads were extended up to the bell.

The bell was first preheated, using a large, double Bunsen burner. The welding operator started with the carbon arc type of welding, and finished with the metallic arc process. Phosphor bronze welding rods were used, having an analysis of about 95 per cent copper and 5 per cent tin.

The bell bears the inscription:

For Taunton
To the Church the Living Call
And to the Grave I Summon All.
1804 George Holbrook Brookfield, Mass.

An interesting piece of evidence of the long life of bells is the fact that bells at the church in Hailsham, England, have been rung since 1198, a period of 729 years.

FIG. 2—PREPARED FOR WELDING

FIG. 3—WELDING THE BELL

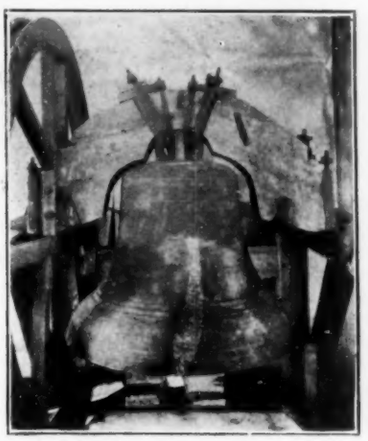


FIG. 4—THE BELL WELDED

Machining Magnesium Aluminum Alloys

Q.—Can you furnish me with information about the machining, drilling and reaming of magnesium-aluminum alloys.

A.—For the machining of the magnesium-aluminum alloys it is advisable to use carbon tool steel, as for brass, as the same results will be procured in place of using high speed steel, which increases the cost. The angle of the cutting tools and cutting edges should be very keen and the marks of emery wheel should be removed with oilstone. For average turning round nose tools will give good results. The angle for cutting should be from ten to fifteen degrees, and a clearance of 12 degrees is practical. Speeds from 250 to 300 feet per minute are recommended. Deep cuts with coarse feed can be obtained and fine feeds for fine cuts.

Carbon tool steel drills and taps are used for magnesium-aluminum alloys. Drills can be run at 150 to 200 feet per minute; heavy feeds can be used in drilling these alloys. Threading chasers with a slight hook ground on them work satisfactorily and give good results in cutting threads. Magnesium-aluminum alloys are in general machined and the tool characteristics are very similar to those of brass.

A cutting compound is recommended of kerosene and soap water.

The principal difficulty in the machining of these alloys is caused by the clogging of chips which become firmly wedged in the teeth of taps, chasers, cutters and similar tools. By the use of the right kind of cutting lubricant this can be avoided.—P. W. Blair.

Plating Barrel for Cyanide Baths

Rubber Clad Steel Barrels Which Resist Cyanide Solutions

By C. J. WERNLUND

A Contribution from the Electroplating Laboratory of The Roessler & Hasslacher Chemical Company, Perth Amboy, N. J.

The introduction of barrel plating of small metal articles dates back to about 1896 when the Electrolytic Plating Apparatus Company of London patented[1] "An improved machine for the electro deposition of metals in a perforated drum designed to rotate in the electrolyte, and having an axis which forms the negative pole." In practice, this consisted of a hexagonal perforated wooden barrel mounted so that it could be rotated at any desired speed in the plating bath. The apparatus was designed for use in nickel plating solutions of the nickel ammonium sulfate type, in which chemical corrosion is only a minor factor. Under these conditions well seasoned hardwood construction proved in most cases satisfactory.

As long as barrel plating was confined to the sulfate or acid type of bath, hardwood diaphragms continued to give good service. When later this type of apparatus

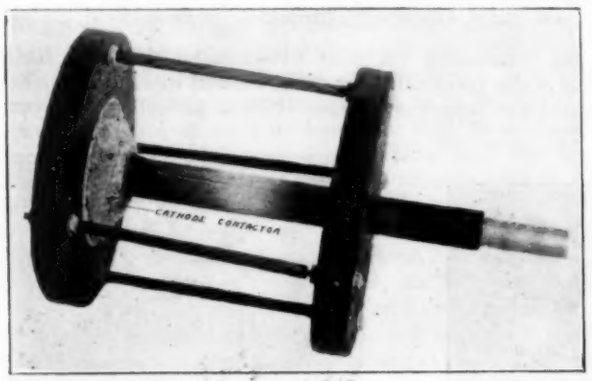


FIG. 1—HOME-MADE SQUIRREL CAGE BARREL

was utilized in heated copper and brass cyanide plating solutions, hardwood diaphragms were found to disintegrate. More recently, the widespread utilization of zinc and cadmium cyanide baths which contain from about 1 per cent to 5 per cent or more of caustic soda has further intensified the disintegrating action of the cyanide bath upon the diaphragm.

This difficulty is pointed out by Blum & Hogaboom[2] who say:

> One of the most difficult problems in the construction of a plating barrel is the material for the perforated diaphragm. The simplest and cheapest material is wood, which is extensively used in the form of strips with holes as small as necessary to prevent the articles from passing through. In spite of the fact that wood is attacked by the solutions and is abraded by the rubbing of the metal articles, it is more generally used than any other substance. Celluloid and hard rubber have been employed and in some cases their greater service makes up for increased cost. Wooden cylinders are sometimes provided with relatively large holes, and coarse cloth, such as burlap, is placed outside the wood when very small articles are to be plated. In other cases canvas is stretched over the frame, and supported by wooden strips.

The difficulty of satisfactorily replacing wood in this instance arises from the fact that such a substitute must be a strong, light insulating material possessing adequate resistance to disintegration and abrasion in a warm caustic soda-cyanide medium. Hard rubber, micarta, celluloid and similar materials have all been found to disintegrate more or less and require frequent replacement of wearing surfaces.

Since no single satisfactory material could be located which would meet all the requirements, it was decided to see if a simple combination of two materials could not be used. Upon looking into the subject from this angle it became evident that steel could be used if it could but be economically insulated with a highly wear-resistant material. Vulcanized soft rubber was found to be just such a material. Its wearing and insulating properties are not materially affected by warm caustic soda-cyanide baths over long periods. It is cheap and readily procurable in the open market.

In combining these two materials, the memory of a home-made squirrel cage suggested the design used in making an experimental barrel. A worn out one-bearing jeweler's plating barrel furnished the shaft, bearing and driving mechanism. In order to be able to compare the performance of the rubber clad steel with wood, the ends of the barrel were made of two well seasoned white oak boards, 8 inches in diameter and 1 inch thick. The lower end piece was bolted to the rubber covered steel driving shaft, against a reinforcing cone shaped steel washer contactor. The upper circular end was then bolted to its mate by means of four, ⅛ inch steel rods, 8½ inches in length. Each of these rods was insulated by covering it with a 6 inch length of ⅛ inch rubber tubing prior to bolting on the upper wood disc. The central axis was similarly insulated with ¾ inch ruber tubing slipped on during assembly. This is illustrated in photograph No. 1.

The cylinderical portion of the barrel was made of ⅛ inch steel rods, 8 inches long, covered with ⅛ inch

FIG. 2—CAGE WITH 5 RODS REMOVED

heavy wall pure gum rubber tubing. These rods were held in place in ⅛ inch holes ½ inch apart and ½ inch from the circumference, in the two hardwod ends of the barrel. This feature of the construction is clearly shown

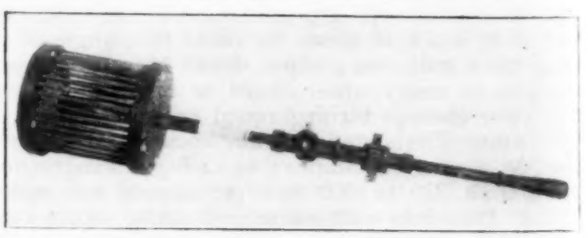


FIG. 3—ASSEMBLED BARREL

[1]English Patent No. 5,274 of 1896.
[2]Blum and Hogaboom, "Principles of Electroplating and Electroforming," Page 181.

in photograph No. 2 in which the partial removal of five of the rods also demonstrates a means of charging and discharging the barrel. Photograph No. 3 shows the assembled barrel ready for use.

The rubber on the central axis has been in intermittent use for over two years, and that on the ⅛ inch steel rods for over three months, in a zinc cyanide solution. None of it shows any appreciable aging or wear. Previously a white oak diaphragm wore out in less than one month.

Small plating barrel diaphragms for handling bolts, nuts, rivets, and similar moderate sized materials can be quickly and economically constructed as outlined above. In larger units it will be found desirable to replace the rods by 1-2 inch or larger sized steel pipe. In other cases, especially where it is not convenient to keep the barrel wet at all times, it may be preferable to make the two ends of the barrel of rubber coated sheet steel such as is now manufactured by one of the large rubber companies. It should also be possible to obtain rubber clad steel diaphragms having the same dimensions as the wood board diaphragms now in common use on octogonal shaped barrels should such a material prove to be more economical than the rubber tube insulated steel rod construction described above.

In most cases, the chief advantage of the rubber clad steel barrel will accrue from its rugged construction in combination with its excellent abrasion resistance.

The steel construction makes possible diaphragms having more and larger openings thus enabling the operator to maintain materially higher currents per load at a lower voltage. Production can therefore be increased, and the need for an internal anode disappears.

Larger diaphragm openings reduce the solution drag-out and help to maintain the metal content of the bath at the cathode.

Finally the elimination of wooden diaphragms overcomes the contamination of the bath by the alkali soluble constituents in the wood.

Nickel and Copper Solutions

Written for The Metal Industry by CHARLES H. PROCTOR, Plating-Chemical Editor

Q.—No. 1. I would like you to answer a few questions in regards to a nickel solution. This solution is in a still tank of 200 gal. capacity, built on the basis of—16 oz. single nickel salts, 2 oz. ammonium chloride 2 oz. boric acid, to 1 gal. of water. The solution is not used steady, sometimes, 1, 2 or 3 days a week, some weeks not at all.

The solution has been built about 3 months. The anodes cover over with an orange yellow scum, very heavy. A few of the anodes were put in a short time ago and are broken very nicely, the rest have been used for about 7 or 8 months and partly decomposed. The scum does not seem to insulate them. Now what causes this scum? I have the anodes cleaned and in a few days they are covered again.

When I first started this solution it was inclined to pit somewhat. Solution showed acid reaction. I put in about 8 fluid ounces of ammonia, and later 1 lb. of sodium perborate dissolved in water and acidulated with muriatic acid to about the same degree of acidity as the nickel solution. That is all to my knowledge that has ever been added to this solution. Will you please set me right about this solution?

No. 2. I am plating a lot of thumb buttons for trip rod on emergency brake lever in the same solution as above on plating rack, 160 tips per rack, 80 tips on each side, the ones in the center do not plate well. Each button has an area of 2 sq. in. Do you think by using sodium sulphate, the solution would throw in better?

No. 3. In making up acid copper solution, which is the proper way to measure the sulphuric acid—by volume or avoirdupois ounces?

A.—We would suggest that in the future, when your nickel solution remains idle for several days at a time, that you electrolyze it with nickel anodes as the cathode and a fairly strong current. The anodes coating over with an orange yellow scum denotes that this is basis nickel and iron hydroxide. This can be kept in solution by additions of small amounts of acetic acid at intervals. You can safely add ¼ oz. liquid measure to each gallon of solution to start with, preferably at the close of the day's work. Repeat at intervals of 2 or 3 weeks. As a neutralizing factor for free acid in nickel solutions, never add aqua ammonia. It is detrimental. Sodium perborate is better—⅛ oz. per gallon of solution, or magnesium carbonate 1/32 oz. per gallon. The addition of Epsom salts or sodium sulphate up to 16 ozs. per gallon will increase the conductivity of the solution. The Epsom salts have proved very satisfactory. Maintain the solution at not less than 75° F.

COPPER SULPHATE SOLUTION

The following formula gives excellent results.

Water—1 gallon; Copper sulphate—28 ozs.; Sulphuric acid—4 ozs., by volume of liquid measure; Yellow dextrine—⅛ oz.

Use half boiling water to dissolve the salts first, then add cold water. Best results are obtained when the solution is lightly air agitated. Use soft sheet copper anodes.

Monel Metal in Dye Tanks

The use of monel metal for the lining of dye vats and for the covering of tables on which dyed felt is laid after being taken out of the vats has been adopted by the management of the hat factory of Crofut and Knapp, South Norwalk, Conn.

Copper was formerly used but it was found that it is not entirely inert to the dye chemicals and that some of the more delicate shades of felt were damaged. This difficulty has been obviated by the new linings and coverings.

The illustration shows a portion of the dye department of the hat factory. The tables on which piles of hat cones are resting have been covered in this way as well as the vats on the right.—F. A. WESTBROOK.

DYE VATS, MONEL METAL LINED.

Electrodeposited Coatings for Prevention of Corrosion

A Paper Read on January 19, 1927, at the Meeting of the Electroplaters' and Depositors' Technical Society, at the Northampton Polytechnic, Clerkenwell, England.

By H. SUTTON

In no section of the art of electrodepositing metals has there been in recent years more activity than in the production of coatings to protect the underlying metal against corrosion.

While the protection of metals against the influence of mineral acids, sulphurous gases, photographic chemicals, explosives of various kinds, etc., is of importance to the respective branches of industry concerned, probably more general interest attaches to the protection of metals against corrosion in the atmosphere, or when exposed to the normal wear and tear of every-day life.

With reference to metals to be protected, iron and steel constitute a very large section of the work thus treated, and perhaps more attention should be paid to these metals in a paper of this kind.

Most of the metals in common use possess to some extent the property of protecting themselves as a result of the formation of a film of oxide or hydroxide on the surface by the combination with atmospheric moisture and oxygen. In general, such films are, however, imperfect owing to impurities and discontinuities in the metal, and the degree of protection afforded is poor.

ATMOSPHERIC CONDITIONS

When a metal is exposed to atmospheric influences it becomes coated with a film of moisture which is formed, even in dry weather, whenever changes in temperature result in the air becoming super-saturated with water vapor. Under these conditions the metal, iron, is in contact with an electrolyte, into which it sends out ions. If no more moisture and no other factor were introduced, a stage would be reached at which no further ions would enter the solution, but under normal circumstances atmospheric oxygen oxidizes the ions and continuously removes iron from the solution in the form of insoluble hydroxide. So long as oxygen and water are available the process continues, and the familiar process of rusting occurs.

The process is facilitated, and the breakdown of any natural scale or oxide or hydroxide coating is hastened in the case of metals exposed to the atmosphere by the presence of ammonia, carbon dioxide, nitrogen, sodium chloride and sulphur present in atmospheric precipitations. In insular countries such as ours, a salt atmosphere is liable to prevail as far inland as forty miles under suitable conditions of wind. We may therefore regard atmospheric moisture as an electrolyte which will react with most common metals exposed to its influence. When two metals in contact are exposed to it, the attack on the more reactive one is facilitated and in many cases accelerated by the presence of the other.

PREVENTION OF CORROSION

Corrosion may be prevented by protecting the metal with an impervious coating completely covering it and isolating it from outside influences, or by coating it with a metal which will deprive it of the faculty of sending out ions into solution. Typical examples of protection by coatings intended to be impervious are tinning by the hot dipping method, coating with paint, etc. Experience has shown that such coatings are generally not impervious, and do not succeed in preventing corrosion over long periods when the conditions are severe.

One important property required in a metal coating for prevention of corrosion is that of preventing, or of not accelerating, the corrosion of small areas of the underlying metal exposed in the event of the coating being damaged. This requirement can only be met by metals which stand near to or higher than the metal to be protected in the electrochemical series. It is well known that the failure of ordinary tinned steel to resist atmospheric influences is due to small defects in the coating, probably due to defects in the steel and to occluded hydrogen escaping from the steel during tinning.

The ideal case for protection of a metal against corrosion would be a coating of another metal standing slightly higher in the electrochemical series than the base metal, and possessing satisfactory resistance to the corrosion conditions concerned. At present there are anomalies in regard to so-called electrochemical protection, and these are probably due to the manner in which the metals of the coating and of the base react with the corroding medium. As an instance of this, chromium under normal atmospheric conditions appears to behave as a noble metal, and, when deposited on iron, to accelerate corrosion of the iron at points where the deposit is porous. On the other hand, chromium is usually regarded as standing in a relatively high position in the electrochemical series. The metals which in the form of electrodeposited coatings have proved most successful for protection of iron and steel against atmospheric and sea-water corrosion, are zinc and cadmium, and attention will be paid mainly to these in this paper. Nickel, chromium, tin, and lead will be referred to briefly.

ELECTRODEPOSITED ZINC COATINGS

Experience has shown that satisfactory coatings of zinc can be deposited from either of two types of solution, namely, the sulphate and cyanide solution. Both types of solution have been used commercially to a considerable extent. Surveying the two types of solution briefly, the most striking differences lie in the superior throwing power, smaller grain size of the desopit, and lower cathode efficiency of the cyanide solution.

In general, the protection obtainable by electrodeposited zinc coatings on iron and steel is of the same order as that obtainable by hot dipped coatings, but far superior to the latter when considered on the basis of thickness of coating.

It is well known that pure zinc dissolves with difficulty in acids, owing to the relatively high potential required for the liberation of hydrogen at its surface. On the other hand, its dissolution in acids is assisted by contact with metals, such as lead. The inferior resistance of hot coatings, compared with electrodeposited zinc coatings is attributed to lead, iron and cadmium present as impurities in the metal. The same remarks apply to coatings produced by processes of the "Sherardizing" type.

RATES OF SOLUTION OF ZINC COATING

H. Bablik[1] has determined the rates of solution of the

[1] H. Bablik, "Galvanising." (E. & F. N. Spon, Ltd.)

various types of zinc coating in 3 per cent sulphuric acid with the following result.

Type of Zinc Coating.	Time to dissolve 1 gm. per sq. cm.
Hot galvanized	1,209 minutes
Sherardized	1,230 "
Schoop sprayed	2,641 "
Electrodeposited	2,686 "

Owing to the excessively long time required by atmospheric corrosion tests on zinc-coated steel, and their dependence on local conditions, the two forms of corrosion test employed in the author's experiments were a sea-water "wet and dry" test, and a form of sea-water spray test.

In the sea-water wet and dry test, the samples were immersed in sea-water for 24 hours and exposed in the open air for 24 hours alternately. In the sea-water spray test the samples were suspended in the air, but protected from rain and sprayed with sea-water three times each day at intervals of about three hours. These tests appeared to reproduce conditions prevailing in marine areas more closely than the usual continuous spray test, and gave results which corresponded more closely with practical experience.

Tests of zinc coatings on steel obtained from a zinc cyanide solution containing

75 grammes	Zinc Cyanide
37.5 "	Sodium Cyanide
25 "	Caustic Soda
1,000 c.c.	Water

indicated that the protection obtained increases considerably with increasing thickness of deposit up to about 0.0005 in., above which further increase was not so marked, and not proportional to the increase in thickness. Deposits obtained from a solution at room temperature gave somewhat greater protection than others of the same thickness obtained from the same solution at 50° C.

The current densities employed were in the range 4 to 12 amps. per sq. ft., and variation in this range did not have any marked influence on the protective qualities of the deposits. The protective effect of zinc coatings appeared to be improved slightly by heating to 200-300° C. consisting of a solution containing:

Deposits were obtained also from a sulphate both consisting of a solution containing:

200 grammes	$ZnSO_4.7H_2O$
1,000 c.c.	Water

This solution was employed at a current density of 8 amps. per sq. ft., and at room temperature. The deposits obtained were slightly less protective than deposits of the same thickness obtained from the cyanide solution. Additions of Beta-Naphthol to the amount of 0.01 per cent did not improve the protective qualities of the deposits, but it appears probable that additions could be made to the sulphate bath to achieve marked grain refinement and improved corrosion resistance.

In the case of the best zinc deposits on steel, no rusting occurred over periods of 12 to 16 months of the sea-water "wet and dry" test, and 8 to 12 months of the sea-water spray test. These remarks apply to coatings 0.0005 in. thick.

Electrodeposited zinc has been applied successfully to copper, brass, and other industrial metals and alloys; in parts consisting of different metals, zinc plating the various components has frequently been found of advantage in avoiding the effects of contact of dissimilar metals. While the tarnishing of zinc coatings on parts of machines and engineering appliances is not of importance, it is objectionable from the decorative aspect, and renders them unsuitable for many purposes.

ELECTRODEPOSITED CADMIUM COATINGS

Cadmium is a metal resembling zinc in many respects, but of whiter color and more pleasing appearance. Deposits of cadmium on steel and other metals have been found to afford protection against corrosion comparable with that obtained with zinc.

A solution which the author has found satisfactory is due to Brunner[2], and recommended by Schotter[3]. The composition is as follows:—

8.2 grammes	Cadmium Cyanide
29.8 "	Potassium Cyanide
1,000 c.c.	Water

Deposits obtained from this solution at normal temperature and at a cathode current density of 8 amps. per square foot gave satisfactory protection of steel. As with zinc, a considerable amount of protection was afforded by coatings only 0.0002 in. in thickness, but the protection increased with increasing thickness up to 0.0005 in., above which further increase was not proportional to the increase in thickness.

As indicated by sea-water "wet and dry" tests and sea-water spray tests, the protection afforded by zinc and cadmium coatings of equal thickness was of approximately the same order. The statement of C. M. Hoff[4] that "a thin plate of cadmium can be used instead of a plate of zinc several times as thick, in order to provide the same degree of rust-resistance," was not borne out by the author's tests. On the other hand, in view of the known influence of minute quantities of impurities in electrodeposited metals on their corrosion properties, it would not be wise at this early stage to draw any firm comparison between the two metals. From a practical standpoint, a factor of considerable importance is the relative degree of reliability and ease of operation of cadmium and zinc-plating baths. If, as many investigators believe, cadmium will prove more capable of deposition with consistently satisfactory results than zinc, this will do much to establish its position in the plating industry.

The corrosion-resisting properties of cadmium deposits on steel were improved considerably by heating to moderate temperatures, but the effect was most marked when temperatures in the range 200-300° C. were employed. The increase in protection afforded to the steel was slightly more marked than that observed with zinc. The deposit assumed a distinct yellow color after heating to 300° C., and the influence of the oxide film may be considerable as affecting the properties of the coated steel.

ELECTRODEPOSITED NICKEL COATINGS

While a considerable amount of protection can be afforded to copper, brass, bronzes, and other metals and alloys, the degree of protection on steel is poor. In general, rusting occurs in relatively short time of continuous exposure to the atmosphere.

The process of corrosion of nickel-plated steel resembles that of commercial tinned iron in that it commences at places where the deposit is porous or has some form of defect. The nickel itself does not corrode appreciably, but it accelerates corrosion of the underlying steel from which it tends to become detached. At present it appears that extremely heavy deposits of high quality are required in order to obtain even moderate protection.

On brass, copper, and bronzes the conditions are very different, and the degree of protection is much greater. Defects in the coating have not apparently the same importance as in coatings on steel.

This paper will be concluded in an early issue.—Ed.

[2] Brunner, "Electrolytische Abscheidung der Metalle aus den Cyanidelosungen," Diss, Dresden, 1907.
[3] Schlotter, "Galvanostegie," 1910.
[4] C. M. Hoff, "Cadmium: its Electrodeposition for Rustproofing Purposes." Lecture to Am. Electrochem. Soc. October 11th, 1926.

Meeting of the New York Platers

The New York Branch of the American Electro Platers' Society met on Saturday, February 19, 1927, at the Aldine Club, New York City for their eighteenth annual banquet and Founders' Day celebration.

The educational session was opened at 3 P. M., by R. J. Liguori, chairman of the Banquet Committee who introduced F. J. MacStocker, president of the branch. Mr. MacStocker welcomed over 200 members and guests to the meeting and turned over the session to Charles H. Proctor who was to act as chairman. Mr. Proctor made a short speech outlining his experiences in watching the growth of electro-plating in various parts of the United States and laid special emphasis on the extraordinary development of chromium plating.

A paper was read by **T. A. Gardner** on **"Some Odd Coloring on Brass and Copper Goods."** The paper was illustrated by samples of brown in various shades and green finishes on brass and copper lamp stands and electric light fixtures.

F. T. Taylor of **A. P. Munning and Company,** gave an interesting talk on the "Electrical Equipment of the plating Room.' Mr. Taylor explained the electrical devices used, such as generators, bus bars, voltmeters, ammeters, rheostats, ampere-hour meters, etc., giving their functions and peculiarities. He pointed out the importance of simplicity in their construction and the necessity for perfect insulation.

Mr. Graham of Hanson and Van Winkle Company, discussed the **Activity Series.** He listed the important elements in order of their chemical activities and explained the phenomen of metal deposition by simple immersion, showing that the greater chemical activity of some elements allowed them to deposit upon others of lesser activity. Mr. Graham also explained the method of protecting one metal by a coating of another using the difference in potential or chemical activity to retard corrosion.

Professor C. G. Fink presented a lecture on the **Restoration of Ancient Bronzes** assisted by **C. H. Eldridge.** Professor Fink explained the work of restoring corroded bronzes, in some cases thousands of years old, by reversing the corrosion process which had removed metals, and re-depositing metals. The details of the process were given in The Metal Industry for July, 1925, pages 272-273.

Dr. Wm. Blum of the Bureau of Standards spoke on the **"Selection and Specification of Electro-Plating."** By this he meant specifically that the electroplater must be able to explain the reasons for and methods of doing his work, and also the usage which his work would be able to stand. Briefly stated, four leading questions were of utmost importance when considering electro-plating.

1. Why plate?
2. What plate?
3. How plate?
4. How much plate?

The answers to these questions involved the following elements.

1. To obtain surface properties of the articles to be plated either for improved appearance or for protection.
2. In order to answer this question the conditions under which the article was to be used must be known and also the properties of the different metals which might be plated on it.
3. In order to know how to plate the metal decided upon, the plater must have a first hand, intimate and detailed knowledge of his equipment, both mechanical and electrical, and his solutions. The solutions must be made up in proper proportions and kept to these correct proportions by proper control methods.
4. How much plate is deposited should be known by every plater; in other words, the thickness of metal thrown down on the article. These figures can of course, be obtained by the use of the ampere-hour meter and standards for metal deposition per ampere-hour.

Following the Educational Session, the banquet was held and afterwards the dance and general entertainment. The meeting was one of the best attended in recent years and the program was of unusual high grade. Souvenirs and favors were distributed at the dinner and the usual good time offered by the New York Branch banquet was in evidence. About 550 members and guest from other branches attended the banquet.

Dipping, Pickling and Cleansing Brass Castings

Q.—I am writing to try to find out the usual practice among brass and bronze foundries in preparing castings for machining operations.

What I have in mind are castings that are plain; no cores. I want to find out what pickling and cleansing methods are the present practice. That is first, Second, how are castings cleaned that require cores in making them?

Is the common practice to bright dip all castings that are milled, turned and chilled, or has pickling and sand blasting taken the place of bright dipping.

I have conducted some experiments that look promising and different from the practice at the factory and wish to obtain various opinions on present methods in general use.

A.—Brass castings for the market, having no cores are generally cut from the gates and the burrs ground off. Then they are either tumbled in a water barrel or sand-blasted. The tumbling process injures the corners and edges so that castings requiring sharp features should be sand-blasted.

Sand-blasting also cleans the inner portions of the casting. When charging the tumbling barrel, care should be taken so that a good proportion of small castings be added or ashes from the pit fires or skimmings. This small material works into and around the larger castings and with the aid of plenty of water cleans the work thoroughly. Of course, the quality of the metal in the castings has much to do with the final appearance where bright colored castings are required. Only new or first metal should be used. Metal that has been re-melted many times loses its life and will not show a bright surface, frequently burning into the sand.

It is not common practice to bright dip castings that are to be milled and turned. Pickling brass castings also is not done. Commercial castings are tumbled or sand-blasted and when made of a good grade of metal should have a bright appearance.—W. L. Abate.

Secondary Metals

Abstract of a Report by the Bureau of Mines, Washington, D. C.

By J. P. DUNLOP

MARKET CONDITIONS

The most significant feature of the secondary metal trade in 1925 was the large expansion in the quantity and value of certain classes of scrap metals and drosses. Notwithstanding an increase in the quantity of scrap copper and scrap brass exported, the quantity of virtually all the secondary metals reported to the Bureau of Mines as used by domestic refineries and smelters increased.

Scrap-metal dealers and smelters did a large business in 1925 and, on the whole, a prosperous one, though profits on a basis of turnover probably were less than in 1924. Competition was very keen for most grades of scrap metals, and the margin of profit in covering orders was very small in many cases, especially in the first half of 1925. There was less leniency shown by smelters and refiners in interpreting grades and packing specifications. Some of the difficulties were caused by the presence of lead in copper, of moisture content in battery plates, and of allowances for iron in automobile radiators. Foreign consumers also raised some trouble regarding quality of materials and packing standards. Export business was partly restricted because of continued financial difficulties in Europe.

Waste-trade circles have devoted considerable time to discussion of the trouble with the waste-material business. It is the consensus of opinion that competition in the smelting and refining of old metals and drosses has been so keen that much business is being done at a loss, and that ingot metal made from scrap is being sold at an increasingly lower price than the selling price of new pig metal.

Many authorities in the waste-material trade believe that, on the whole, secondary metal dealers and smelters do not give enough consideration to the cost of collecting, sorting, remelting, and refining scrap; that too much is frequently paid for scrap and drosses, so that the only opportunity for a profitable sale is to gamble on an advance in market prices of metals. Undoubtedly many of the small dealers and smelters have been forced out of business. To seek some remedy for many problems confronting the makers of ingot from scrap metals, the Brass Ingot Manufacturers Association was formed in March, 1926, as a division of the National Association of Waste Material Dealers. The association, of which Benjamin Harris, of Chicago, is president, seeks all brass-ingot makers in the United States as members, and proposes an extensive study of costs and other subjects. There are about 1,000 brass foundries in the United States, and the general tendency of late years has been to stop making brass ingots and to buy them from large manufacturers. However, the large users of brass, such as automobile companies, railroad companies, etc., tend more and more to make their own ingots. As industrial plants in the United States operated at nearly 85 per cent of capacity during the first part of 1926, there is no indication of a slump in any large scrap-producing or scrap-using branch of trade, so it is safe to predict that the value of secondary metals produced and used in 1926 will not be less than in 1925, though the average price of some of the scrap metals will be lower.

SECONDARY METALS RECOVERED

The quantity of the metals contained in numerous alloys made partly or wholly from secondary material cannot be ascertained definitely. The figures given as the result of the annual canvass are only approximate, but they constitute the sole available data on an important industry.

The increase in the value of the secondary metals, exclusive of gold, silver, platinum, iron, steel and ferroalloys, recovered in the United States in 1925 was due in part to the higher average price of all metals and the much larger recoveries of secondary copper, lead, antimony and aluminum.

The amount of secondary platinum metals recovered in 1925 was 43,274 troy ounces, 79 per cent of that recovered in 1924, and equaled 34 per cent of the platinum metals imported for consumption in the United States during the year.

The value of the gold and silver contained in old jewelry, dental waste, tableware, ornaments, and other articles remelted or refined in 1925 was $36,660,828. Mints and refineries reported the recovery of 9,897,416 fine ounces of silver and $29,792,021 in gold from waste or discarded material. Jewelry and dental waste furnish the largest supplies of secondary gold, and silverware and photographic waste of secondary silver.[1] The recoveries of silver from waste film and from photographic solutions probably amounted to more than 1,000,000 ounces. The consumption of silver in chemical and photographic industries in 1925 is estimated at 7,000,000 ounces and that in the arts and industries in the United States at 31,000,000 ounces.

Most of the silver recovered from photographic waste is obtained from solutions and is recovered by the larger makers of films and plates and by the motion-picture industry. Generally these solutions contain less than half an ounce of silver to the gallon. The recovery from waste film is probably 800 ounces to the million feet.[2]

SECONDARY METALS OF CERTAIN CLASSES RECOVERED IN THE UNITED STATES, 1924-25

	1924		1925	
	Short tons	Value	Short tons	Value
Copper, including that in alloys other than brass	196,500	$51,483,000	250,600	$71,170,400
Brass scrap remelted	274,000	58,444,200	242,300	56,270,800
Lead as metal	90,400	32,720,000	112,420	39,477,100
Lead in alloys	114,100		114,460	
Zinc as metal	58,886	9,020,000	61,430	11,359,000
Zinc in alloys other than brass	10,500		13,300	
Tin as metal	7,700	31,062,100	7,950	35,165,400
Tin in alloys and chemical compounds	23,600		23,000	
Antimony as metal	90	2,025,600	1	3,794,000
Antimony in alloys	9,314		10,839	
Aluminum as metal	10,350	14,596,200	17,700	24,816,000
Aluminum in alloys	16,650		26,300	
Nickel as metal	114	1,227,500	191	1,518,000
Nickel in non-ferrous alloys and salts	2,126		2,109	
	.....	$200,578,600	.....	$243,570,700

[1] A recent patent for the recovery of silver from solutions used in photographic work is No. 1527942, Feb. 24, 1925, issued to Louis Weisburg, New York, N. Y.

[2] Byers, C. A., "Recovery of silver from movies' laboratory waste," Eng. and Min. Jour.-Press, Aug. 26, 1922, p. 373.

Classification of Waste Materials

The following is a list of official definitions of secondary material as laid down by the National Association of Waste Material Dealers:

Heavy copper—This shall consist of copper not less than one-sixteenth inch thick and may include trolley wire, heavy field wire, heavy armature wire that is not tangled, and also new copper clippings and punchings, untinned and clean, and copper segments that are clean.

No. 1 copper wire—To consist of clean untinned copper wire not smaller than No. 16 B. & S. wire gauge; to be free from burnt copper wire which is brittle, and all foreign substances.

No. 2 copper wire—To consist of miscellaneous clean copper wire such as of necessity would be taken out of the heavy copper and the No. 1 copper wire, but to be free of hair and burnt wire which is brittle.

Light copper—Shall consist of the bottoms of kettles and boilers, bathtub linings, hair wire, burnt copper wire which is brittle, roofing copper and similar copper, free from radiators, brass, lead and solder connections, readily removable iron, old electrotype shells, and free of excessive paint, tar and scale.

Composition or red brass—Shall consist of red scrap brass, valves, machinery bearings, and other parts of machinery, including miscellaneous castings made of copper, tin, zinc and/or lead; no piece to measure more than 12 inches over any one part; not to weigh over 60 pounds; to be free of aluminum and manganese, and also free of railroad boxes, cocks and faucets, gates, pot pieces, ingots and burnt brass.

Railroad bearing—Shall consist of railroad boxes or car journal bearings; must be old standard used scrap; free of yellow boxes, also iron backed boxes and must be free of babbitt; also free of excessive grease and dirt.

Cocks and faucets—To be mixed red and yellow, free of gas cocks and beer faucets; shall be at least half red.

Heavy yellow brass—Shall consist of heavy brass castings, rolled brass, rod brass ends, brass screws, and tinned or nickel plated brass tubing; to be free of iron and dirt, and must be in pieces not too large for crucibles; no piece to measure more than 12 inches over any one part; must be free of manganese mixtures and condenser tubes; must be free of aluminum brass containing over 0.20 per cent of aluminum.

Yellow brass castings—Shall consist of brass castings in crucible shape; that is, no piece to measure more than 12 inches over any one part; must be free of manganese mixtures and must not contain over 0.20 per cent aluminum.

Light brass—Shall consist of light sheet brass forks and spoons, miscellaneous brass that is too light for heavy; to be free of any visible iron, radiators, gun shells containing paper, ashes, or iron, loaded lamp bases, and clockworks.

New brass clippings—Shall consist of the cuttings of new sheet brass; to be absolutely clean and free from any foreign substances.

Brass tubing—Shall consist of brass tubing, free of nickel plating, tinned, soldered, or tubes with cast brass connections; to be sound, clean tubes, free of sediment and condenser tubes.

No. 1 red composition turnings—To be free of plastic, railroad car box turnings, aluminum, manganese and yellow brass turnings; not to contain over 2 per cent free iron; to be free of grindings and foreign material, especially babbitt. Turnings not according to this specification to be sold subject to sample.

No. 1 yellow rod brass turnings—Shall consist of strictly rod turnings, free of aluminum, manganese, composition, Tobin and Muntz metal turnings; not to contain over 3 per cent free iron, oil or other moisture; to be free of grindings and babbitts; to contain not more than 0.30 per cent tin and not more 0.15 per cent combined iron.

No. 1 yellow brass turnings—Shall consist of strictly rod turnings, free of aluminum, manganese, composition and Tobin turnings; not to contain over 3 per cent of free iron, oil or other moisture; to be free of grindings and babbitts. To avoid dispute, to be sold subject to sample.

No. 1 pewter—Shall consist of tableware and soda fountain boxes, but in any case must test 84 per cent tin. Siphon tops to be treated for separately.

Auto radiators (copper and brass)—Ford, 2 pounds deduction on a Ford plate; three-quarters pound for each iron water connection; 1 pound for each side sheet iron strip. All other radiators to be subject to deductions for actual iron.

Zinc—Must consist of clean sheet and cast zinc; also cast batteries, to be free of loose oxide and dross, sal ammoniac cans, and other foreign materials.

Tin foil—Shall consist of pure foil free of lead composition and other foreign ingredients and matters.

Electrotype shells—Must be hand picked and free of loose dross and chunks of dross.

Battery lead plates—Shall consist of dry battery lead plates; moisture not to exceed 1 per cent; allowance to be made for wood, rubber, paper, moisture.

New sheet aluminum clippings—Shall consist of new sheet aluminum and cuttings; must be free from oil, grease and any other foreign substances; must be guaranteed not less than 98 per cent pure aluminum.

Aluminum wire—Shall consist of aluminum wire guaranteed 98 to 99 per cent pure aluminum, and must be free from corrosion and any other foreign substances.

Painted sheet aluminum—Shall consist of painted sheet aluminum and must be absolutely free from iron, dirt or any other foreign substance.

Aluminum castings—Shall consist of aluminum castings, free from iron, babbitt, brass and any other foreign substance; must not exceed 2 per cent of oil and grease.

Old sheet aluminum—Shall consist of old and manufactured sheet aluminum; must be free from painted sheet aluminum, iron, dirt and any other foreign substance.

Aluminum borings—To avoid dispute, should be sold subject to sample.

Aluminum foil—Shall consist of pure aluminum foil, free from paper and any foreign ingredients.

Babbitt metal—Shall contain bearing metal of all kinds; shall not contain scrap hard metal, Allen metal (which is copper and lead alloy), die cast, zinc boxes, or type metal.

Monel metal scrap—Must be in sheets, clippings, castings, bars or rods; must be free of iron and other foreign materials. To avoid disputes, to be sold subject to sample.

Monel metal turnings—Must be free of iron and undue percentage of oil and moisture.

THE METAL INDUSTRY

With Which Are Incorporated

THE ALUMINUM WORLD, COPPER and BRASS, THE BRASS FOUNDER and FINISHER
THE ELECTRO-PLATERS' REVIEW

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EDITORIAL

INSTITUTE OF METALS DIVISION ACTIVITIES

The winter meeting of the Institute of Metals Division described on page 99 of this issue, was in many ways one of the outstanding gatherings in its history. In addition to the papers presented, and these included a number of unusually high grade, reports were made of the progress along additional lines which point to fields of usefulness never before attempted.

A word about the papers will not be amiss before going into the additional activities. Abstracts will be found in the report of this meeting, but special mention should be made of the meeting devoted to zinc; the paper on Beryllium Copper Alloys by W. H. Bassett and the paper on Copper Alloys Systems with Variable Alpha Range and Their Use in Hardening Copper by M. G. Corson. The last named paper attracted considerable attention and many felt that the work done should provide the copper industry with a new type of material with a broad field of application.

The increased usefulness of the Division was thrown into sharp relief by the activity of the committees appointed to take up various phases of its work. These phases now include encouragement of local sections; development of data sheets in co-operation with the American Society for Steel Treating; the publication of at least a page of news and items of technical interest in every issue of Mining and Metallurgy; the gathering of papers for the meetings; the attraction of new members, and the encouragement and aid of research in non-ferrous metals.

This list alone is imposing enough but its strength is doubled by the real work of the chairmen of these committees who have bent themselves to their tasks and made extraordinary progress in the last year.

A list of problems submitted by the Research Committee is the evidence of the interest which exists in this phase of the Institute work. It will be a source of gratification not only to the Institute but to industry that the National Research Council has offered to co-operate with the Division in helping to place these problems in various laboratories where the actual work can be done.

So much for the brighter side, and we must temper our succeeding remarks by admitting that there is never a brighter side without its inevitable darker accompaniment. In all this activity, in all directions, strangely enough, no special provision has been made for the practical or non-technical foundryman or metal worker. Perhaps this impression was gained by the fact that the Winter Meeting of the Division is always devoted largely to laboratory work while the operating papers are reserved for the meeting with the American Foundrymen's Association. In 1927, however, there will be no meeting with the American Foundrymen's Association. It will be held with the Steel Treaters instead, which again makes the outlook dubious for the practical man.

We bring this to the attention of the officials of the Division, knowing that this condition has not been brought about by choice. The work of the Institute has been swinging slowly perhaps, but steadily into the laboratory and out of the plant. The Division has had to follow along the lines in which it got the best co-operation and the practical man is notorious for his lack of ability or desire or both, to work with technical societies. We do not believe, however, that the answer lies in dropping him. We do not underestimate the difficulty of the problem but believe that it is all the more worth while solving. It is to the interest of the Division to keep the practical man in its fold. Without him, there is always the temptation to get deeper and deeper into the intricacies and involvements of abstract theory. The practical man may be heavy but by that very fact his feet remain on the ground.

We take the liberty of suggesting to the officials of the Division who have done such fine work in the last two years and in some ways almost re-built its structure, the formation of a Committee to take upon itself the development of the operating or works side of the manufacture of metals and metal products. This will mean not less attention to the laboratory but more for the plant. In the hands of a committee as active and conscientious as those now in existence, this effort should result in the development of a broader Division, with wider ramifications and a membership and influence far beyond what it has ever enjoyed.

AN INVENTORY OF AMERICAN RESOURCES

At the recent meeting of the American Institute of Mining and Metallurgical Engineers, a joint meeting was held with the Mining and Metallurgical Society of America, to discuss the subject of the exhaustion of our mineral resources; specifically, copper, lead, zinc, coal, iron and oil. The subject is obviously one which invites most concentrated attention and the best thought of all those who have our manufacturing industries at heart. Without attempting statistical proof it is safe to say that the great majority of our manufacturing industries are directly dependent upon the minerals mentioned above and exhaustion of any of them would be positively calamitous.

As an important side light it was pointed out that the first step toward knowledge of the state of our natural storehouses was a calculation of our resources, or the amounts of metals or minerals blocked out in the ground. This job, colossal as it seems, could be done, with sufficient time and money applied to it. But here enters a complicating factor. The problem is not only geological and mathematical, but also chemical and economic. A copper mine may estimate that its reserves are good for 20 years, basing these estimates on the fact that it can mine ore running over 3 per cent in copper. Afterward, however, a process may be developed by which ore running 1½ per cent in copper is minable. Immediately this may double or triple the resources of this mine.

The same may be true of the oil, although of course in a much lesser degree. While in this industry resources are increased at the present time only by locating pools, still there is the shadow of the recovery of oil from shales, ready to become the dominant factor in the oil field when, as and if its methods are improved. Coal and iron seem

to offer no problem at this writing, and while little can be said definitely about the time 100 years from now, too many things are certain to happen in such a period to make it either necessary or advisable to make such far-off predictions.

The question of tin came up and it is, as ever, a large thorn in the side of American industry. We use more tin than the rest of the world combined and we produce almost none of it. There are only three theoretical possibilities to overcome this condition and all of them are equally remote. They are:

(1.) The purchase or control by American capital of foreign tin mining enterprises.

(2.) The development of substitutes for tin.

(3.) Location of tin deposits in the United States and the development of processes for its recovery.

The most important constructive step taken at this meeting was the passing of a resolution to present a plan blocked out by V. H. Manning to the head of the Department of Commerce to conduct a complete survey of the mineral resources of the world (not only the United States), and to keep up this survey; in other words maintain a "perpetual inventory" of the world's mineral resources. This information would be used at all times for purposes of national information and protection.

The manufacturer who uses metals seldom, if ever, stops to think twice about where they come from and how they reach him. All he knows is that he pays the price and gets them. The time may come, however, when not only the producer of metals but the consumer will find it important to keep in touch with the supply situation and to guide his enterprises accordingly.

THE BUILDING INDUSTRY

As everyone in the metal manufacturing line knows the building industry is one of the most important consumers of metal products. This applies to foundries, rolling mills, plating shops, and practically all other branches of the metal manufacturing industry. Consequently the condition of the building trades is of utmost interest and should be watched very closely.

Conflicting estimates are always to be found, but never have estimates varied so widely as those for the year 1927. The Architectural Forum prophesies another big building year ahead. They carefully note, however, that "it is difficult to conceive that the year 1927 will record as great a national building investment as thatof 1926. All indications point to the fact that while 1927 will prove to be one of the great years of building history, its total investment in new building construction will be approximately 12 per cent less than 1926."

The year 1926 showed a total national expenditure of over $6,000,000,000 in new building construction. Including alterations and unrecorded transactions, the figure probably amounted to over $7,000,000,000. Therefore, according to the estimate noted above, 1927 should show a total expended for building, new and altered, of about $6,000,000,000, while the new building total should be about $4,850,000,000.

On the other hand, we have an estimate from the Copper and Brass Research Association stating that in the coming year, $9,000,000,000 will be spent on building in the United States. This figure is arrived at by estimating that $4,300,000,000 will go into new buildings; repair and maintenance are estimated at $4,050,000,000; normal loss from fire and storm will call for about $535,000,000; making a total of about $8,885,000,000. Such an estimate admittedly is staggering, but it seems to be backed by figures from reputable sources.

The real point, however, is not the accuracy or inaccuracy of any one set of figures. It is the fact that the building industry has grown to be one of the largest and most important of all trades, and that even replacements, disregarding new work entirely, have reached a total which is almost beyond the total of new work and repairs of the days before the war. Although most of us expect building to fall off somewhat during the coming year, and are consequently taking up slack to prepare for this contraction, the falling off cannot be of such great proportions as many have seemed to fear in the past. Looking at it from the worst possible angle, a decrease of 10 to 15 per cent in the total investment in building would be serious matter for all those engaged primarily in this industry. To the country as a whole, however, it would not spell panic, and to trades like metal manufacturing, which supply other industries as well as building, it should mean nothing more than added pressure in other lines to make up for this decrease.

It behooves those selling to the building trades to be ready to put forth their best efforts in other lines wherever possible. Building construction is not going to pot in 1927. It may fall off to a limited extent (it may not fall off at all) but it should not fall off enough to do serious injury to the supplying trades. All that is needed is reasonable foresight and care on the part of those engaged in these trades.

WELL INTENTIONED WASTE

Elsewhere in this isue will be found a short review of the business career of O. C. Harn, the new managing director of the Audit Bureau of Circulations. Mr. Harn who has been for years advertising manager of the National Lead Company, is a well-known figure in the metal trades and needs no further introduction.

At a recent dinner to publishers, in honor of Mr. Harn, he was presented with a platinum watch and chain to signalize the event of his change to serve the entire trade rather than one company. The gift was sincerely intended, fully earned and of course appreciated. But we should like to add our small voice to the effect that in these times of constant and unremitting effort to cut down waste, conserve resources and make every ounce of material and every dollar do its utmost, a watch or any other gift made of something besides platinum would have been more in order. Platinum is a useful and no doubt, attractive metal when used in jewelry. It is infinitely more useful when used in industry. Other metals can be and no doubt, will be made as attractive for jewelry as soon as the public can be educated up to them. One company is already launching a campaign in favor of palladium jewelry.

Perhaps the decisive step will be the discovery of a good substitute for platinum in industry. At one stroke this will remove one of the large and insistent markets for platinum and the price will undoubtedly drop sharply.

Will platinum at low price, still be as attractive in jewelry? From some of the reports of the whims of this industry it is an open question.

CORRESPONDENCE and DISCUSSION

Although we cordially invite criticisms and expressions of opinion in these columns, THE METAL INDUSTRY assumes no responsibility for statements made therein

WAGE METHODS IN FOUNDRIES

To the Editor of THE METAL INDUSTRY:

You may be interested in some conclusions relative to the foundry industry recently presented by Harry D. Neach, Director of the Market Analysis Division of The Sherman Corporation, to the Newark Foundrymen's Association.

A real opportunity exists in the foundry industry, according to Mr. Neach, for cost reductions through the more general introduction of plans of wage incentive.

Mr. Neach cited a recent survey of The Sherman Corporation relative to wage methods which shows that of the foundries surveyed in this investigation, an average of 55 out of every hundred employees is paid on straight time or day rate; and the average of 41 out of every hundred employees are on piece rate; while only 4 out of a hundred are on one of the forms of premium or bonus.

"Straight time or day rate has proven a costly, wasteful method of paying wages," said Mr. Neach. "Engineering authorities agree that manufacturers get back in real output value from 40 to 70 per cent of the dollar value of wages paid on straight time or day rate. With 55 employees out of a hundred in the foundry industry still on this basis, there seems to be no question but what a study and installation by foundries of more modern, scientific wage payment systems can be made to yield real profit to the industry.

"Of course, a wage method depends for its success upon the thoroughness with which it is installed and fitted to the individual needs of each foundry. Because a certain method of paying wages may be good for one industry, it cannot necessarily be transferred automatically to another. Scientific study is essential."

Mr. Neach also pointed out conditions in the foundry industry revealed by a survey conducted by The Sherman Corporation showed that there is need in the foundry industry of scientific methods and technical practices in order to save time and eliminate other forms of waste.

Mr. Neach believes that foundries have been backward in this regard, and that the present keenly competitive conditions make it imperative that foundrymen overhaul every phase of their methods and equipment. He also recommended a more intensive study of merchandising, and suggested that to relieve the present surplus of plant capacity in the foundry industry that it would be well to investigate the possibilities of new products.

GEORGE L. MOORE,
Assistant to the President.
The Sherman Corporation.

Boston, Mass.
February, 11, 1927.

PLATING INTEREST IN AUSTRALIA

To the Editor of THE METAL INDUSTRY:

Being a subscriber to THE METAL INDUSTRY for some time, (also my employer, W. Fieldgate, manufacturer, 261 Riley Street, Surry Hills, Sydney, for a greater period), we have both taken a keen interest in the sound articles written in that paper by members of the American Electro-Platers' Society. Consequently, we would both very much appreciate it if you would give us some information on how to gain membership to that society.

I have been employed by the above mentioned gentleman as foreman plater for the last four years and am a student of the International Correspondence School, studying general chemistry, which course I have about one-third completed.

You will no doubt see from this letter exactly where we stand. Also know how valuable the information has been that we have received from THE METAL INDUSTRY.

Of course, out here in Australia, there are not many technical schools running chemistry classes, while none of them has a class for teaching advanced electro-plating. So it would be fine if we could be connected with such a Society as the American Electro-Platers. We will eagerly await your reply.

H. D. Wright,
Sydney, Australia.

January 10, 1927.

We publish this letter to show how THE METAL INDUSTRY and the American Electro-Platers' Society are watched with interest all over the world. The writer was, of course, referred to George Gehling, Secretary-Treasurer of the Society.—Ed.

WHITE GOLD STRIP

To the Editor of THE METAL INDUSTRY:

I read in the November issue of THE METAL INDUSTRY your formula on white gold strip, (Problem 3576), and wish to state that I have used that formula for several years with success. I also add 2 ozs. per gallon of carbonate of potash, which helps a great deal.

JAMES SMITH.

Brooklyn, N. Y.
February 15, 1927.

TECHNICAL PAPERS

An Investigation of the Physical Properties of Some Nickel-Iron Alloys of the Invar Group. By Eric Anders Blomovist.

1. The co-efficients of expansion between 20°-100° C. and up to 625° C. have been determined on some iron nickel alloys which had been rendered presumably sulphur free by additions of magnesium.

2. Alloys made as indicated above still require small additions of manganese for ready forgeability.

3. The effects of nickel and of manganese indicated by earlier workers are confirmed. Additions of either or both increase the co-efficient of expansion.

4. The effect of heat treatment is also indicated. Annealing causes a decrease in length while quenching produces an increase. On the other hand, annealing raises the co-efficient of expansion while quenching lowers it.

Electrodeposition of Rubber. By S. E. Sheppard and L. W. Eberlin, Eastman Kodak Company, Rochester, N. Y.

This paper was read in full at the New York meeting of the American Electro-Platers' Society in July, 1926, and a short note of it was published in THE METAL INDUSTRY for July. A more extended abstract has been published in the India Rubber World for December 1, 1926, describing the process, the apparatus, anodic molds, latex compounding, continuous production, quality of electro-deposited rubber, advantages of the process, applications, and future possibilities.

The Load Test for Fire Clay Refractories. By M. C. Booze. Published by the American Refractories Institute, Oliver Building, Pittsburgh, Pa. Size, 6 x 9, 12 pages. Price, 25 cents.

This is a reprint of a paper presented at the annual meeting of the American Refractories Institute in Philadelphia, Pa., May 12, 1926. The author establishes the following points.

1. The load test should not be used for determining the suitability of fire clay brick to meet a variety of service conditions.

2. For selecting brick to support loads in furnace walls and arches, the load test should be run under the temperature and load conditions of actual use.

3. Deformation is not apt to be an important cause for failure of fire clay brick in a furnace wall and will occur only when a high temperature is developed at a considerable depth in the wall.

Chromium—Its Properties and Uses. By Dr. C. G. Fink, Journal Society Automotive Engineers, January, 1927.

This is a summary of chromium and its progress in industry. The author discusses its history, occurrence in nature, extraction from the ores, alloys with iron and steel and importance in modern construction. It is stated in one place that without chromium steels, the modern automobile could not be built. Chromium plating is also discussed.

Improving Electric Conductor Alloys. By M. G. Corson, Electrical World, January 15, 1927.

This paper discusses the requirements of electrical conductors and the characteristics of alloys of aluminum and copper. It describes new alloys of copper which possess great strength and wear resistance. Some of these alloys are:

1. Nickel, 2.6; silicon, .6; copper, balance; tensile strength, 87,000 pounds; Brinell hardness, 160; conductivity, 58%.
2. Nickel, 4.2; silicon, 1; copper, balance; tensile strength, 115,000 pounds; Brinell hardness, 196; conductivity, 45%.
3. Cobalt, 1.8; silicon, .5; copper, balance; tensile strength, 80,000 pounds; Brinell hardness, 160; conductivity, 65%.
4. Chromium, .5; silicon, .15; copper, balance; tensile strength, 52,000 pounds; Brinell hardness, 95; conductivity, 81%.

Bend Tests of Galvanized Sheet Steel. By H. A. Stacy.*

A special committee of the Federal Specifications Board conducted a series of tests in order to secure reliable information on the ability of galvanized sheet steel to withstand severe bending, as published data and information from manufacturing sources were scarce. The work which is described in full in this paper shows that the minimum mandrel thickness allowable for bend tests of a sheet carrying a light coating can be considerably less than that for a sheet of the same gauge carrying a heavier coating. A more definite statement than this does not appear to be warranted.

The effect of the gauge of the sheet upon the results of bend tests made on sheets of different thickness but carrying approximately the same coating is not nearly so obvious. In making such a comparison it is necessary first to express the mandrel thickness in fractions of an inch. A comparison in this manner of the 16, 22 and 28 gauge sheets with the light coating (less than 2 ozs. per sq. ft.) showed the average permissible mandrel thickness to be 0.20 in. for 16-gauge sheet, 0.14 in. for 22-gauge, and 0.10 in. for the 28-gauge sheet. This corresponds approximately to 3, 5 and 6-sheet thicknesses for the light-coated sheet of 16, 22 and 28-gauge, respectively.

A study of the tabulated results and the curves showed that for a substantial proportion of all the sheets, there were a few, often only one or two, specimens showing a bend failure with high mandrel thickness. The curves as a rule show a fairly uniform gradient up to the 90% point. It was decided, all things considered, that a reasonable bend test should require only two of three specimens to be tested, to meet the bend test requirements. In deciding upon the minimum thickness of the mandrel over which the specimens must withstand being bent without failure of the coating, consideration was therefore given to the mandrel thickness corresponding to the 66⅔% point of the curves. In nearly all cases the minimum mandrel thickness specified was taken as somewhat less than that shown by the "average" curve, but considerably above that shown by the lowest curve.

* Abstract of a paper read at the Pittsburgh meeting of the American Institute of Mining & Metallurgical Engineers, October, 1926.

Proposed Clause Covering Bend Properties

The following is the clause covering the bending properties, both 90° and 180° bends, of galvanized sheets, which has been embodied in the proposed specifications for this class of materials:†

Bend Tests—Galvanized Sheets

(a) All coatings shall be tightly adherent, and shall not flake or peel off when bent as hereinafter specified at a minimum temperature of 65° F. All weights of coating shall withstand bending at right angles (90°) with the upper edge of the brake set back one thickness of the material, or in other words, so that the radium of the inside of the bend is one thickness, the brake being operated at a speed to complete the bend in five seconds.

(b) Three bend pieces, about three by six inches, shall be cut from each test strip specified in paragraph 6, adjacent to spot test pieces noted in paragraph 10. These shall be bent flat (180°) over a mandrel having a semi-circular edge, and tightened in a smooth-jawed vise to the required thickness, meanwhile forcing the mandrel down into close contact with the inside of the bend. (The mandrel may be made of some of the material being tested by bending the required number of thickness and hammering flat.) Of each three test pieces, at least two shall withstand being bent without failure of the coating in accordance with Table VI.

Table VI.

Thickness of Mandrel for Flat Bend (180°) Tests.

Weight of Coating Oz./Sq. Ft.	22-Gauge and Heavier Thicknesses	Lighter Than 22-Gauge Thicknesses
2.5	5	8
2.0	4	6

† U. S. Government Proposed Master Specifications for Sheets, Iron and Steel, Flat Black, Flat Galvanized and Corrugated Galvanized.

New Books

Bound Volume of THE METAL INDUSTRY—January-December, 1926. Size 9 x 12, 534 pages. Price, payable in advance, $3.00.

The bound volume of THE METAL INDUSTRY comprises the text pages of our journal for 12 months. An extended review is hardly necessary, but the advantages of having all of the year's issues between two covers are such that the publication of this volume is worth noting.

All of the material published in each issue, aside from advertising, is included, covering leading technical articles, editorials, correspondence, book reviews, shop problems, patents, new equipment, reports on associations and societies, personals, obituaries, business reports and special items of interest, monthly reviews of the wrought metal and ingot metal business, metal prices and supply prices.

Special articles of interest are too numerous to list in full, but a few will bear special mention. They are: Casting Shop Practice; Tensile properties of Soldered Joints Under Prolonged Stress; Chemical Analysis and the Electro-Plater; Profits in Fabricating Copper; When Is Electric Heating Advisable? Smelting Secondary Aluminum and Aluminum Alloys; Chromium Plating on Printing Plates; A General Survey of Chromium Plating; Reclamation of Foundry Sands; New Welding Processes; Drop Forging Metals; Metal Spinning; A Simple Method for Measuring Polarization and Resistivity; Progressive Policies for the Platers' Society; Diseases of Brass Deposits; Analysis of Plating Solutions; Brass Foundry Pointers; The Fundamentals of Brass Foundry Practice; Statuary and Art Bronzes; Mixing Babbitt; Health Hazards of Brass Foundries; Temperature Determination in the Metal Foundry; Shall We Have Chromium Plated Gold Jewelry? The Application of Technical Control to the Metal Rolling Mill; Refractories for Metals; Electro-Sherardizing; Electro-Deposition of Tin; What Do We Know About Copper-Nickel Alloys? Electro-Plating Tin.

The Oxwelder's Manual. Published by the Oxweld Acetylene Company, Long Island City, N. Y. Size 6 x 9, 216 pages. Price $1.00.

The Oxwelder's Manual is a book of instructions for welding and cutting by the oxy-acetylene process, now in its 9th edition, completely re-written. Published as it is by one of the leading manufacturers of oxy-acetylene welding equipment it has the stamp of knowledge and experience. It must be made clear that this book is not a catalog but a manual for the practical welder and cutter of metals by the use of oxy-acetylene.

A fair portion of the book is devoted to non-ferrous metals which can be seen from the following chapter headings: Welding Brass and Bronze; Welding Monel Sheet and Castings; Welding Cast Aluminum; Welding Copper.

Other chapters of more general interest but none the less valuable are: Oxygen and Acetylene; Process of Oxy-Acetylene Welding and Cutting; Equipment for Welding and Cutting; Precautions and Safe Practices; Shop Layout and Organization.

SHOP PROBLEMS

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE

ASSOCIATE EDITORS { JESSE L. JONES, Metallurgical; WILLIAM J. PETTIS, Rolling Mill; W. J. REARDON, Foundry; W. L. ABATE, Brass Finishing; CHARLES H. PROCTOR, Plating Chemical; P. W. BLAIR, Mechanical

BRASS SOLUTIONS

Q.—I am called upon to install 5 brassing tanks in a rush, and would be pleased if you could let me have formula of a good reliable solution to be operated cold and still, suitable for coating iron work. I have to use unskilled help so would like one that gives a minimum amount of trouble. I have used hot brasses but always had more or less trouble to keep a regular color.

A.—We are submitting to you a formula for brass solutions that has been incorporated in "Platers' Wrinkles," page 9, for many years. This formula will always give results if it is maintained continuously upon its original basis as given by standard methods of control. The proportions can eventually be increased at least 50% for more rapid deposits. Water 1 gallon; sodium cyanide 96-98% 5 ozs.; copper cyanide 3 ozs.; zinc cyanide 1 oz.; bicarbonate of soda 1 oz.; ammonium chloride ½ oz. Use anodes 80% copper; 20% zinc. Temperature 80 deg. F., at 4 to 5 volts. To prepare the solution, figure out the gallon capacity of your tanks, then the pounds of the several materials required based upon the number of pounds required. Place ⅓ of the total amount of water required in the tank first, then heat to 140 deg. F., place in the water all the cyanide required, then follow up with the copper and the zinc; stir thoroughly. Add the balance of the water cold, then the bicarbonate of soda and finally the ammonium chloride. Stir again thoroughly. Let the solution cool down to normal temperature. It will then be ready for operation. To brighten the brass deposit use sodium arsenite. You can purchase this material as a chemical compound so it will avoid cutting down arsenic with caustic soda, etc. Add from 1/64 to 1/32 oz. per gallon, plus or minus as may be required. The addition of ⅛ oz. caustic potash per gallon of solution at intervals when the anodes coat over with zinc oxide, will keep them clean and eliminate the use of ammonia to maintain color.—C. H. P. Problem 3,614.

BRIGHT NICKEL

Q.—I do bright nickel barrel plating, using cadmium sticks as brighteners. My work is small articles made of brass and some of steel. The articles come from the nickel as good as you would care to see, but I seem to stain the steel articles when I dry them. The brass articles come out O. K. My solution seems all right. I never use excess acid. They stand about 5.8; single nickel solution, boracic acid, and sal-ammoniac. How can I dry the steel articles without staining? At present I am washing in pickle water, then in lukewarm soap water.

A.—To prevent brown stains on bright nickel plated steel surfaces produced by the aid of cadmium metal in the nickel solutions, avoid an excess of cadmium in solution. Keep it slightly more acid than for a regular nickel solution or about 4.75 or 5.0. The addition of Epsom salts up to 8 to 12 ozs. per gallon of solution may give you a nickel deposit that will not become brownish in drying.

Instead of using a warm soap solution, use a cold solution, then rinse direct in hot water and dry out. The soap solution should be prepared as follows:

In 1 quart boiling water dissolve 1 to 2 ozs. borax soap chips or any neutral soap chips then add the balance of cold water to make a gallon. Use as outlined. One or the other method should overcome your problem.—C. H. P. Problem 3,615.

BRONZE BUSHINGS

Q.—We are having a great deal of trouble making bronze bushings with ½" and ¾" core 1" to 2" O. D. 12" long. The bushings look alright at both ends, but the center is way off.

We use an ordinary core from core machine and have made them up on end also flat, using chaplets.

We would greatly appreciate it if you could help us out of our difficulty.

A.—We suggest you make these cores so you can use a rod in the core. We assume your core from the core machine is without rods. Even with a core made in a corebox and rodded a ½" size, the core is difficult to handle. It is necessary to use a brass wire as a chaplet in cope and drag in center of bushing. If you will do this and use oil sand mixtures for your core sand you will overcome your troubles. If you pour the castings on end no chaplets are necessary only the rodding of the core. If you pour on the flat use the wire chaplets.—W. J. R. Problem 3,616.

BUFFING SILVER PLATE

Q.—What is the best method to follow in buffing silver plate? I am in a job shop and get some reflectors to resilver. I use a small loose buff for color buffing, speed about 1800. This leaves marks that look like scratches. How can I overcome that? What kind of buff would be best? I use red rouge.

A.—Automobile reflectors, presuming they are made of brass, should be finished by the following procedure: Remove the old silver and nickel surface by polishing and buffing to a new lustre. Cleanse carefully, then nickel plate for a few minutes to obtain a bright nickel surface. Remove, wash in water and silver strike in a solution prepared as follows: Water 1 gallon; sodium cyanide 7 oz.; silver cyanide ⅓ oz.; caustic potash ¼oz., ammonium chloride ½ oz. Voltage 5 to 6. Anodes sheet steel. Strike for a few moments, then remove and plate in the regular solution without burning for 10 minutes. Remove, wash and dry out and color buff. A six-inch buff should be used for the purpose made of loose sections, not sewed buffs; between each section place a small section of buff about 2½ inches in diameter. These small sections will keep the 6 inch sections apart so that the buff will not be so hard. Run at 2000 r.p.m. or more. In a piece of wood 2" wide and 6" or 9" long and 1" thick, drive wire nails in the end ½" apart. Use this to comb out the buff so it will be soft and pliable. For the polishing medium, mix lamp black with kerosene oil to a thick paste. Put just a very small amount of the paste on the reflector—not on the buff. With care, you will produce a lustre equal to any new automobile reflector.—C. H. P. Problem 3,617.

CASTING FUNNELS

Q.—We are pouring our strip metal 63/38 and 70/30, through cast iron funnels. While this is satisfactory we have not been successful with phosphor bronze (95% copper, 5% tin, 4 ozs. phospher copper, sufficient to act as the oxidizer), owing to the fact that the phosphor bronze attacks the cast iron and dissolves it. Can you suggest to us a metal of which we can make the troughs which would not be attacked by the phosphor bronze, or alternatively some refractory lining?

A.—We have found that cast iron of 3% silicon and high carbon and low phosphor with 2% aluminum is very satisfactory for this class of work when a pouring cup or funnel is used to direct the metal into the mold. Where a trough is used a refractory lining is advisable. There are a number of high temperature cements on the market for this purpose, or you can make such a refractory yourself by taking, 20 parts carborundum fire sand and 1 part German fire clay, mixed well and tempered to a working clay. It sticks well and stands the heat after drying. It can be put as thick as desired. There is also a method of swabbing the cast iron mold with bone ash mixed to a paste.—W. J. R. Problem 3,618.

CLEANING SILVER

Q.—At various times I am expected to clean Sterling silver articles in distillate to remove the grease from buffing, I dip them in a solution of cyanide and scratch-brush them direct without

rinsing in clean water. These are my orders but I find the cyanide is very disagreeable in its effects on my hands, especially as I often have small cuts on them. Can you suggest some other solution to use after the distillate?

A.—We suggest that you discontinue the use of cyanide in your scratch brush water. It is absolutely unnecessary to use cyanide and is detrimental to your hands to have them continuously immersed in such a solution. In the old days, bran water was used exclusively for scratch-brushing silver. The method used was to add bran to warm water, stir thoroughly; allow to settle, then use the remaining solution. The bran acts as a softener for the water and enables the articles being brushed, to be clean and uniform. The next best factor is bicarbonate of soda. Add about 2 to 4 ozs. per gallon of water; the latter material is universally used in gold, silver, copper and brass scratch-brushing operations. After brushing and washing in water, you can re-immerse in the cyanide dip, then in cold and hot water. Try these suggestions. You will obtain better results than when cyanide is used in the scratch-brushing operations.—C. H. P. Problem 3,619.

COLORING COILED SPRINGS

Q.—We should also be glad if you would give us information from your readers as to what process we could adopt to get coiled wire as per enclosed sample in plain colors and jazz pattern, and the colors would not have to break on the wire when it was bent.

Can you also give us a formula, either powder or liquid, for cleansing grease from the hands.

A.—The only method we can suggest for coating the coiled spring as per sample in plain colors and in jazz patterns is as follows: The spring wire, coiled, should be lacquered with a regular celluloid dip lacquer which can be purchased from any lacquer manufacturer advertising in THE METAL INDUSTRY, or their local agents in England. The lacquer so applied should become hard and dry.

Procure aniline dyes soluble in grain alcohol or fusel oil and prepare concentrated solutions of the colors desired in either medium. Wood alcohol cannot be used; it would dissolve the lacquer coating. Immerse the lacquer-coated wire or springs in the dye for a moment, then drain quickly and wash in clean, cold water; dry slowly with heat. The success of the method will depend upon facilities to handle the product quickly. It is the lacquer that becomes dyed. It will be tenacious and stand up under any bending test if properly applied. Jazz colors can be applied by making several separate dips in several colors. This is the only feasible method we can recommend to you. You can prepare a liquid soap for cleansing off grease from hand, etc., by dissolving 2 lbs. tri-sodium phosphate in 1 gallon of hot water, 180 deg. F. Add about 4 ozs. soap chips or good yellow soap sliced into chips; a cold bottle for use.

A splendid paste or hand cleansing soap may be prepared as follows: 30 lbs. tallow; 5 lbs. borax powder; 1 lb. powdered alum; 5 lbs. washing soda; 5 lbs. soap chips; 1 quart water glass; 1 oz. oil of wintergreen; 5 gallons boiling water; 35 lbs. pine sawdust. To prepare the soap, dissolve the washing soda, borax, alum, water glass and soap chips in the boiling water. Melt the tallow, then stir into the solution until dissolved. Add the oil of wintergreen to give a pleasant odor. Finally add the pine sawdust; some sand could be used to replace some of the sawdust. Any amount required can be prepared from the proportions given.—C. H. P. Problem 3,620.

COPPER ON ZINC

Q.—Please furnish me with the following information: Can zinc be practically copper-plated? If so, what voltage and maximum current density would be required for a light smooth deposit? What bath would you recommend and what temperature? About how often would it be necessary to change the bath or add salts to it? Would there be any chance of the zinc entering the solution?

A.—Copper is being successfully plated over zinc in the overall button trade. It is necessary however, to operate the copper solutions at temperatures from 120 to 140 deg. F. Zinc oxide on the surface of the buttons and on the insides is reduced and eventually the copper solution, or rather the deposit, takes a bronze tone. This can be compensated however, by using all the copper anode surface that is possible to use in the plating tank from every angle. Then depend upon sodium cyanide and sodium bisulphite as the replenishing factors as much as possible. For every oz. of sodium cyanide added, add ¼ oz. bisulphite of soda. The following formula should give excellent results: (The proportions may be increased 50 per cent if desired). Water 1 gallon; sodium cyanide 5½ ozs.; copper cyanide 4 oz.; bisulphite of soda 2 ozs.; caustic potash ½ oz. Prepare the solution in the order given. Use ⅓ of the water first at 140 deg. F., add the sodium and copper cyanides, then the balance of the water cold, then the bisulphite of soda and caustic potash. The solution is then complete. To brighten the copper deposit, 1/32 oz. of hyposulphite of soda may be added per gallon of solution. Voltage, still solution 4 to 5; mechanical 8 to 10; amperage 20 per sq. of surface area. Naturally when the solution finally becomes impregnated with too much zinc, it would be necessary to replace it or replace with 50 per cent new copper solution. We are unable to advise you how often this would be necessary.—C. H. P. Problem 3,621.

CRYSTALLIZED SILVER SOLUTION

Q.—Would you be kind enough to instruct me as to how to rectify my silver solution which seems to form crystals in the bottom of the vat? The solution seems to plate all right, but I know that something is missing when crystals form like that. I may also add that the anodes get very dark while solution is running, and I have to clean them often. The vat is very small, measuring 20" x 12" x 10".

A.—We presume that your silver solution has been operated for quite a long period and the results are that the solution now contains excessive amounts of sodium carbonate which is noted by crystals forming upon the bottom of the tank, and presumably upon the anodes also if left in the solution over Sunday. Your problem is an easy one to overcome. You have cold weather at times. When a very cold evening comes along, place the solution outside so that it can get the full benefit of the low temperature. The next morning the solution will have a considerable quantity of slushy ice-like crystals. These are sodium carbonate crystals, as you have noted, and are the basic cause of your silver anodes coating over so readily. Pour off the clear silver solution, which is best done by using several thicknesses of cheesecloth tacked to a light wooden frame. When the silver solution has all been passed through the cheesecloth, wash the soda crystals that remain with a little cold water; then throw them away or use in your alkaline cleaner. They contain no silver cyanides, for silver converted into cyanides does not freeze. Following these manipulations your solution should be back again to its normal basis. You can then add small proportions of sodium cyanide to the solution to clear up the anodes, from ¼ oz. upwards per gallon of solution. If gold and silver platers once realized this simple method of eliminating the carbonates from their solutions, they would make good use of cold weather.—C. H. P. Problem 3,622.

ZINC PLATING

Q.—We are zinc plating small castings but they turn black after they come out of the tank. Our solution seems to be all right because when the castings are in the tank they plate but turn black after we dry them.

A.—You do not mention the type of zinc plating solution you operate; cyanide or acid? We presume from your statement regarding your difficulties that you operate a zinc cyanide solution.

It is difficult to tell just what is wrong without an analysis of the solution. To improve the conditions, we suggest that you add at least 1 oz. more sodium cyanide per gallon of solution. Figure out the total amount of sodium cyanide required for the entire solution, then dissolve the cyanide in as little hot water as possible at 180 deg. F. or less. In the cyanide solution for every gallon of zinc solution, dissolve ⅛ oz. of red oxide of mercury, for instance for 100 gallons of zinc solution, 12 ozs. of oxide of mercury maximum will be required although it may be possible that half this amount will be sufficient. We give you this data to prove the value of the zinc mercury process so be governed accordingly and obtain permission to use the process.

If the articles are made of cast or malleable iron, then it may be necessary to add occasionally 1 oz. cadmium oxide, dissolved in an equal amount of sodium cyanide per gallon of solution, dissolved in as little hot water as possible previously. Cast or malleable iron is a difficult problem to plate satisfactorily in a cyanide zinc solution.—C. H. P. Problem 3,623.

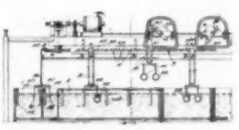
PATENTS

A REVIEW OF CURRENT PATENTS OF INTEREST

1,613,588. January 4, 1927. **Air Brush.** William F. Gradolph and Godfrey Mueller, Toledo, Ohio, assignors to the De Vilbiss Manufacturing Company, Toledo, Ohio.

In an instrument of the class described, inner and outer nozzles having concentric discharge orifices and one having a conical bearing on the other to retain the orifices in concentric relation and to permit rotary adjustment of one on the other, the outer nozzle having lateral air discharge passages, and provision in the conical bearing for the supply of air from a supply source to the outer discharge orifice and also to the lateral discharge passages for producing a fan spray when the outer nozzle is in predetermined positions only of adjustment on the inner nozzle.

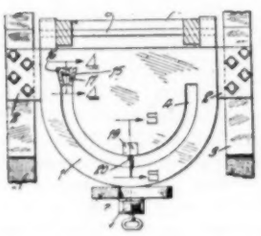
1,613,878. January 11, 1927. **Plating Equipment.** Wilfred O. Emard, Brookfield, Ill., assignor to Elmer J. Mercil, Oak Park, Ill.



In a plating equipment, two plating tanks, one of which is disposed within the limits of the other, a traveling conveyor above the tanks whose line of travel is directionally similar to the line of division between said tanks, and a work support moved by the conveyor and straddling the line of division between the tanks whereby a plurality of articles suspended from said support may be moved simultaneously with some of the articles passing through one tank and the remainder through the other tank.

1,614,303. January 11, 1927. **Process of Producing Corrosion-Resisting Coating on Iron and Steel and Products Thereof.** Chad H. Humphries, Indianapolis, Ind., assignor to Metals Protection Corporation, Indianapolis, Ind.

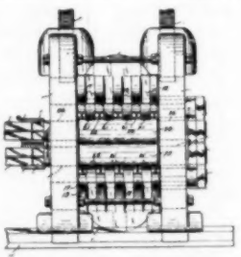
Process of protecting iron and steel articles against corrosion which comprises applying to the surfaces thereof successive coatings of a metal which is electropositive to iron, a metal which is electronegative to said first named coating metal, and finally a coating of chromium.



1,614,360. January 11, 1927. **Apparatus for Making Castings.** Fred C. Granade, St. Louis, Mo., assignor of one-half to Mueller Brass Foundry Company, St. Louis, Mo.

A permanent mold having a cavity of considerable depth and provided with a closure whereby the casting may be withdrawn endwise and a fragile ingate extending along the cavity and adapted to permit withdrawal of the casting.

1,614,422-5. January 11, 1927. **Rolling Mill.** James R. Coe, Waterbury, Conn., assignor to American Brass Company, Waterbury, Conn.



Four patents on a rolling mill of special design and construction for rolling brass. One of the claims is as follows:

In a rolling mill, a pair of spaced housings having transverse openings therein, a working roll between the housings, a backing roll for the work roll extending longitudinally thereof, said backing roll being reduced in diameter at points intermediate its length to form a plurality of spaced bearings and provide a plurality of spaced bearing surfaces to engage the working roll, supporting bearings for the bearings on the backing roll, and a rigid support for said supporting bearings extending between the housings and projecting at its ends into said openings so as to be supported by the housings.

1,614,662. January 18, 1927. **Lead Plating of Metals.** William R. Dickens, Copperhill, Tenn.

The method of lead coating metals which consists in simultaneously subjecting the metal surface to be coated and the lead to the action of an oxhydrogen flame in which the hydrogen exceeds the ratio H_2O.

1,614,752. January 18, 1927. **Silver Alloy and Method of Making Same.** Walter L. Mitchell, Newark, N. J., assignor to Tiffany & Company, New York, N. Y.

A tarnish resisting silver alloy containing over 90 per cent silver and an alkali metal in amount sufficient to produce an alloy softer than the usual commercial silver alloy and the formation of an easily removable deposit when exposed to the atmosphere.

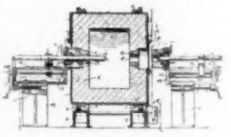
1,614,878. January 18, 1927. **Nickel-Copper Alloy and Process of Making Same.** William F. Cochrane, Baltimore, Md., assignor, by mesme assignments, to U. S. Industrial Alcohol Company, a corporation of West Virginia.

A cast nickel copper alloy having a total nickel content between 20 per cent and 50 per cent, and including a substantial amount of lead, tin and zinc below 5 per cent each, the exterior portions of the casing having a higher nickel content than the interior thereof and the alloy being in the form of solid solutions without the formation of any intercrystalline structure.

1,615,009. January 18, 1927. **Process of Treating Aluminum Dross and the Like.** John G. G. Frost, Cleveland, Ohio, assignor to The National Smelting Company, Cleveland, Ohio.

The method of recovering metallic aluminum from hot aluminum dross or the like containing finely divided particles of molten aluminum, which comprises conveying said dross upwardly of an inclined container, causing particles of said molten aluminum to coagulate and permitting said recovered molten aluminum to flow downwardly of said container.

1,615,109. January 18, 1927. **Electric Furnace.** James Robert Coe, Waterbury, Conn., assignor to The American Brass Company, Waterbury, Conn.



In a rocking electric furnace a horizontal cylinder having in its ends openings in line with the axis of movement of said cylinder, the outer portions of said openings being larger than the inner portions thereof, electrodes substantially filling the inner portion of said openings, plugs surrounding said electrodes and substantially filling the outer portions of said openings, means for moving said plugs relatively to said cylinder, and means for moving said electrodes relatively to said cylinder and plugs, both of said means being supported independently of said cylinder, and means for lifting said cylinder when said plugs and electrodes are in outward position.

1,615,585. January 25, 1927. **Process of Producing Corrosion-Resisting Coatings on Iron and Steel and Product.** Chad H. Humphries, Indianapolis, Ind., assignor to Metals Protection Corporation, Indianapolis, Ind.

The process of protecting iron and steel articles against corrosion which comprises electrodepositing upon the surface of such an article composite coatings comprising a layer of a metal electropositive to iron and a superposed layer of chromium.

1,615,707. January 25, 1927. **Corrosion-Resisting Metal.** Charles E. Jones and Mark A. Atuesta, Schenectady, N. Y., assignors to General Electric Company, a corporation of New York.

An article of manufacture comprising a body of ferrous metal, a film of cadmium thereon and a film of tin overlaying said cadmium film.

EQUIPMENT

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST

NEW AUTOMATIC PLATING MACHINE

Frederick B. Stevens, Inc., Detroit, Mich., have placed on the market a new automatic plating machine which cleans, rinses, electro-plates and dries the work automatically.

Automatic plating machines are now fairly well known but this machine has claimed for it several unique features. The entire machine rests on the floor without any overhead work whatsoever and for that reason the machine lends itself readily to low overhead room. It also allows for hoods over the top of tanks, thus improving ventilation.

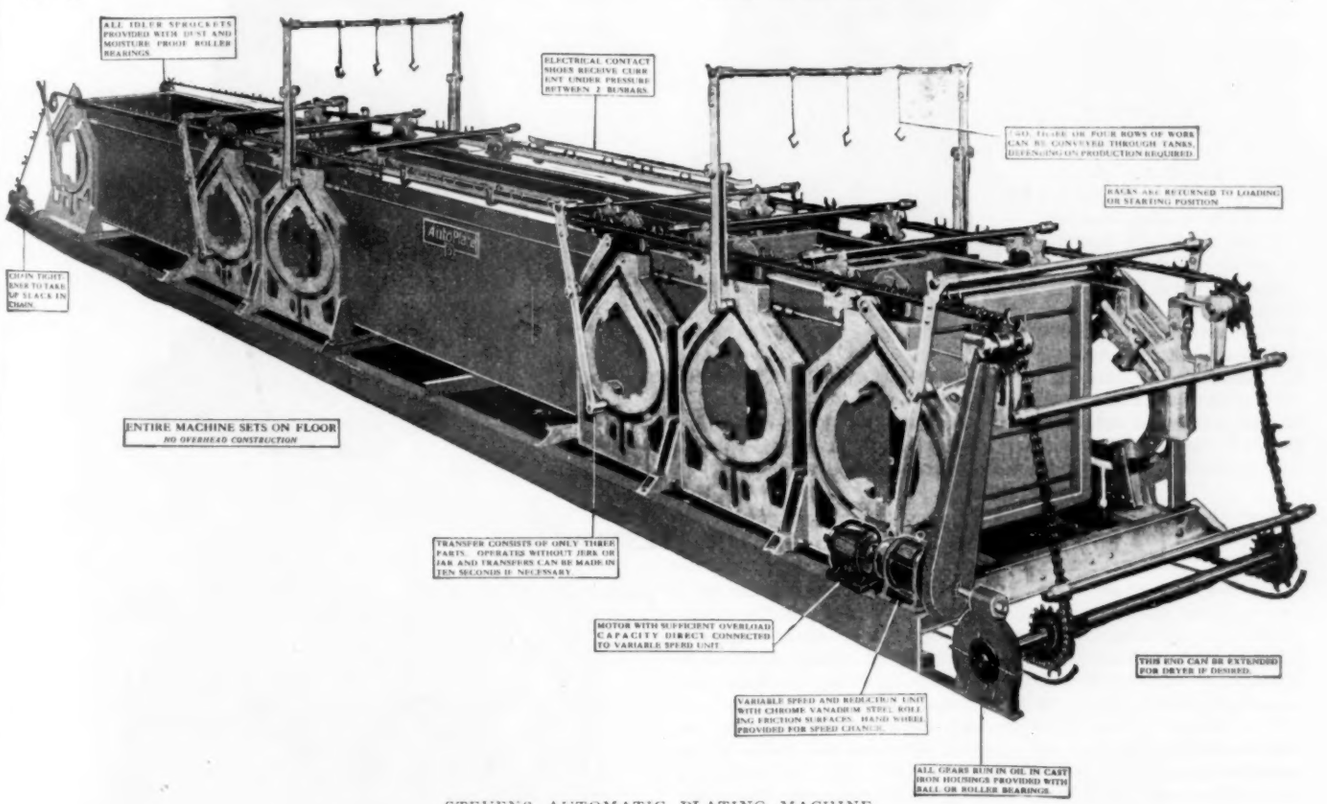
Work rods are returned underneath the tank and back to the loading position without being disturbed in any way.

The plating racks themselves are returned to the loading position on a carrier which is an integral part of the machine. The variable speed control is also another feature which allows the operator to change instantly the speed of the machine, thus regulating it in accordance with the requirements of the work. This machine is designed to carry very high currents, in line with the trend in the electro-plating industry to-day, and it is possible to feed 6,000 to 8,000 amperes, if necessary, to each indivdiual work rod.

The transfer movements of the work from one tank to another follow a rectangle. The work is lifted vertically, then moved horizontally and then lowered vertically into the next tank for the succeeding operation.

Briefly stated, the advantages claimed for this plating machine are as follows:

1. The entire mechanism rests on the floor.
2. Chain stretch does not affect timing.
3. A mechanically perfect transfer in 10 seconds.
4. Work rods returned underneath tank to starting position.
5. Perfected electrical contacts—will carry any amount of current.
6. Variable speed control—period of plating time may be changed instantly.
7. Transfers are individual units—changes in process can be made at any time.
8. Racks returned to loading position on carrier, which is an integral part of the machine.
9. Installation cost—the expense is very low—nearly as simple as putting in still tanks.


ALL IDLER SPROCKETS PROVIDED WITH DUST AND MOISTURE PROOF ROLLER BEARINGS
ELECTRICAL CONTACT SHOES RECEIVE CURRENT UNDER PRESSURE BETWEEN 2 BUSBARS
TWO, THREE OR FOUR ROWS OF WORK CAN BE CONVEYED THROUGH TANKS, DEPENDING ON PRODUCTION REQUIRED
RACKS ARE RETURNED TO LOADING OR STARTING POSITION
CHAIN TIGHTENER TO TAKE UP SLACK IN CHAIN
ENTIRE MACHINE SETS ON FLOOR
NO OVERHEAD CONSTRUCTION
TRANSFER CONSISTS OF ONLY THREE PARTS. OPERATES WITHOUT JERK OR JAR AND TRANSFERS CAN BE MADE IN TEN SECONDS IF NECESSARY.
MOTOR WITH SUFFICIENT OVERLOAD CAPACITY DIRECT CONNECTED TO VARIABLE SPEED UNIT
THIS END CAN BE EXTENDED FOR DRYER IF DESIRED.
VARIABLE SPEED AND REDUCTION UNIT WITH CHROME VANADIUM STEEL ROLLING FRICTION SURFACES. HAND WHEEL PROVIDED FOR SPEED CHANGE.
ALL GEARS RUN IN OIL IN CAST IRON HOUSINGS PROVIDED WITH BALL OR ROLLER BEARINGS

STEVENS AUTOMATIC PLATING MACHINE

GROUND KEY LUBRICANT

Three years ago the United Oil Manufacturing Company of Erie, Penn., was asked by a local manufacturer of brass goods to develop a satisfactory lubricant for ground key work. Over forty formulæ had been tried. The lubricant found most satisfactory was composed of Beeswax, Japan Wax, Degras and Rapeseed Oil. This formula was later found to be the "secret formula" of many makers of ground key work, men coming back at night to make the lubricant so their fellow workmen and competitors would not know what went into it.

The requirements laid down by the local manufacturer were very rigid. The lubricant must never dry out or harden, causing the stem to bind, regardless of the time cocks are stored before being put into service. It must give an easy turning cock. It must not be affected by extremes of heat. It must not be affected by cold.

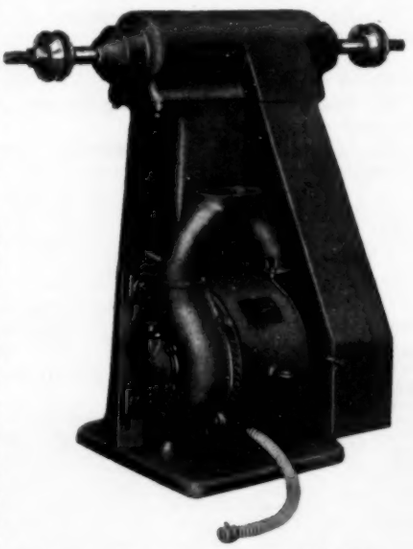
The laboratory of the United Oil Manufacturing Company worked for a period of eighteen months on this problem. During the experimental work practically every known grade of Wax, Gum, Rubber, etc., was used, securing the necessary samples from Europe, Africa, South America and India.

The outcome of this work was a lubricant marketed under the trade name Neverstick Ground Key Compound. This lubricant met all of the rigid requirements of the local manufacturer. In making tests on this lubricant cocks were placed in service on steam lines for a period of eight weeks in an effort to break down the lubricant or melt it off the cocks; but without success. One firm complained that their employees were not careful in applying the lubricant to the cocks and that some of it would be smeared on the outside of the cock. They could not remove this lubricant by boiling the cocks in a soda solution and when removed by cleaning the cocks in a revolving brush, they could not remove the lubricant from the brush. Cocks lubricated with Neverstick Ground Key Compound have been given all manner of severe tests such as dropping them in boiling water, leaving them there a time and removing them, dropping them into cold water in an effort to make them bind. The lubricant however has withstood the most severe tests. Coffee cocks lubricated with this compound have been in service for over a year without binding, still turning as freely as the day they were put into service.

Two other grades of lubricant were developed, No. 17 Neverstick Ground Key Compound, giving an easy turning cock at temperature belok zero; No. 22 Neverstick Ground Key Compound giving easy turning cocks at zero degrees Fahrenheit. All three grades are neutral, meeting the requirement of makers of Chemical Stoneware, as they are not attacked by commercial acids such as sulphuric and hydrochloric.

BUFFING AND POLISHING EQUIPMENT

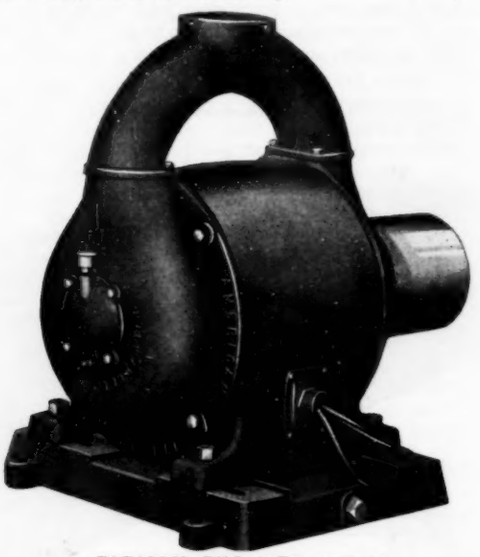
The American Electric Motor Company, Milwaukee, Wis., is the manufacturer of a complete line of buffing and polishing equipment. They are primarily manufacturers of motors and their main products in this line are motors of the polyphase induction type and of the 40-degree totally enclosed self-ventilated type. The latter is used in conjunction with their polishing equipment and is said to be safe against dust or dirt.



REAR VIEW OF BUFFING LATHE

One of the advantages claimed for the totally enclosed type of motor is that the shaft bearings do not churn or develop heat in a bath of oil. They are lubricated through a patented design of a still bath of oil by a special circulating method in which a disc which carries oil into an upper chamber and down by gravity flows through the top of the bearing, down through the bottom and back into the oil sump. This gives a stream line of oil in the bearings at all times and still leaves a major portion lying dormant in the sump.

The motor is hinged and is removable as a unit with the back plate and with a belt take up through a positive locked means of a threaded screw, giving an eight-inch radius movement. Each individual machine is a unit within itself of all electrical apparatus, connections being made at the factory.



TOTALLY ENCLOSED MOTOR

CORE TESTING

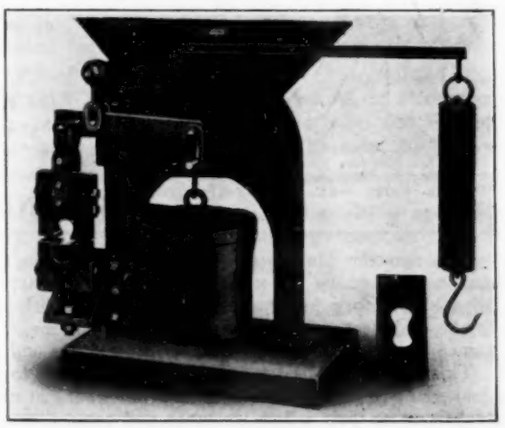
After a number of years of experimenting during which many types of core testing machines were built and tried out, the Wadsworth Core Testing Machine was developed by the Wadsworth Core & Machine and Equipment Company of Akron, Ohio. The machine as now constructed uses a core made in the form of a briquet commonly employed for testing cement and concrete.

The mixture to be tested is made into cores in the core box shown standing between the machine base and the scales in the accompanying illustration. The cores are then baked at a standard temperature and placed between the grips shown at the left of the machine.

The hopper back of the machine is filled with shot and the small pin working in the slotted link above the bucket controls the value at the bottom of the shot hopper. After the core is in place the bucket is hung on the hook and the pin controlling the valve raised. This starts the shot to falling into the bucket. The moment the core breaks the bucket drops and the slotted link throws the control pin down, thus shutting off the shot supply. The shot are then weighed on the scales shown at the right.

BAKING TEST CORES

When comparing sand mixtures or binders the cores should be baked at a constant temperature and under uniform conditions. To accomplish this, a laboratory core oven has been put on the market. This oven is supplied with either gasoline stoves or with gas stoves. This device can be used in any foundry whether equipped with gas or not. A thermometer is passed through a small opening in the top of the oven during baking.



CORE TESTING MACHINE

MAKING SAMPLE CORE MIXTURES

For comparing sands the following procedure should be employed. Take small samples of the regular sand in use or the sand used as a standard and of the new sand to be tested. Make two batches of cores from these and dry some of each batch in the same plate. Then pull them from the machine. In making the sample cores the same binder should be used in each case and also the same proportion of water. Both samples of sand should be dry when making up the mixture, for it has been discovered that from 8% to 10% of moisture by weight in sand may increase its volume as much as 40% when it is not packed hard in the measure.

For comparing sands the same binder should always be used. In the case of oil sand cores it is well to have a sample of linseed oil or of some standard core oil which is kept for this purpose.

Few foundrymen realize the amount of money that could be saved by providing a heated or dry core storage and then looking after the handling of the cores in the plant to see that they are not exposed to the undue moisture. Attention to this fact would in many cases decrease the binder expense more than half.

ELECTRIC MELTING POT

Another addition to the Trent line of electrically heated metal pots for melting solder, lead, babbitt, tin, etc., is a 100 lbs. lead furnace. This, it is claimed, has all the advantages of quick heating, compactness of design and reliability of the smaller sizes, in addition to its larger capacity.

One of the problems which arises in the design of all melting pots when they get above the small class is that of suitable terminal outlets. This, it is stated, has been satisfactorily solved by making a cast terminal box with an outlet in the bottom which can be arranged for BX connection of rigid metal conduit. The terminals are placed horizontally from the side walls of the casting which facilitates connection and inspection.

Another feature of this metal pot is its portability, and, when required, semi-rigid eye bolts secured on the rim of the casting are supplied. These are also useful when pouring direct from the pot into a bearing. The eye bolts then, in co-operation with the hooks from the crane, act as a fulcrum and facilitate pouring.

The crucible is of a special grade of cast iron and the shape has been carefully proportioned to stand the strain incident to heating and cooling of a considerable mass of metal. The casing is of sheet steel with welded seams reinforced with steel bands.

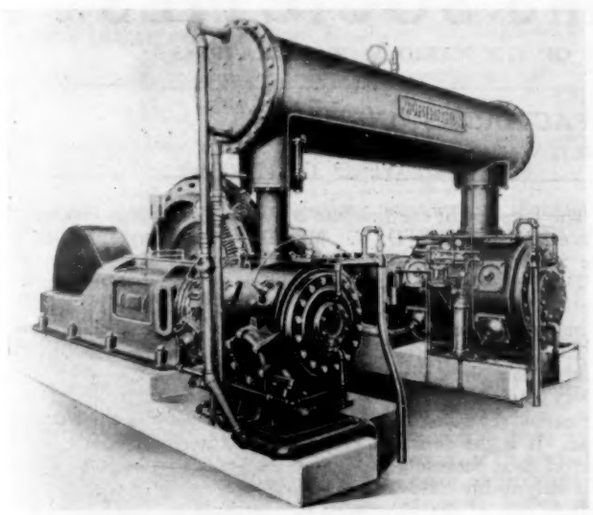
With this larger size of metal pot, the manufacturers recommend very strongly the use of temperature control, as it may be easily realized that when sufficent energy is put into a pot to heat a hundred pounds of metal in thirty-five to forty-five minutes, provision must be made against overheating, not only on account of possible damage to the pot but to prevent losses of the metal. Controlled temperatures decrease dross and current consumption.

100 LB. ELECTRIC LEAD FURNACE

This pot can be used for melting salts requiring a temperature less than 1000° F. It is made by the Harold E. Trent Company, 259 N. Lawrence street, Philadelphia, Pennsylvania.

AUTOMATICALLY CONTROLLED MOTOR-DRIVEN AIR COMPRESSOR

One of the features of the exhibit of the Worthington Pump & Machinery Corporation, New York, N. Y., at the American Foundrymen's Convention, Detroit, Mich., was an automatically controlled synchronous motor-driven air compressor. In this unit the starting of the compressor has been simplified to the point of simply pressing a button, the need for manual unloading and skilled attendance for the motor being eliminated.



WORTHINGTON AIR COMPRESSOR

The synchronous motor driving the compressor is direct-connected on the compressor crank shaft and is provided with an exciter belted from the compressor shaft. A push-button controlled starting panel permits the unit to be started by merely pressing a button, the motor field being "thrown in" automatically at the proper time. The compressor is provided with automatic initial unloading, causing the load on the compressor to be automatically relieved when starting and thrown on automatically when the motor reaches synchronous speed.

The compressor is 15 in. by 9½ in. by 12 in. duplex, two-stage equipped with well known Worthington Feather valves and five-step variable capacity control. By means of the latter feature the capacity of the compressor is regulated by increments or steps of 25 per cent of full rated capacity. This permits varying demands for air to be met without severe fluctuations of the load on the power plant and lines, helping to maintain good voltage regulation within the plant. The compressor is driven by a 105-hp. motor.

TAPER STRIP FLASKS

The aluminum taper strip flask manufactured by the American Foundry Equipment Company, of Mishawaka, Ind., is constructed with a 5-degree taper, the smallest end being at the top, which permits the flask to be lifted off the mold in a vertical direction after the completion of the mold insead of releasing latches and opening hinges on the corners, as has heretofore been common practice with the "straight side wood" snap flask.

There is a sand strip on the lower part of the cope that, after the mold has been completed, is withdrawn (a matter of only about half an inch), which will permit the cope to strip free from

ALUMINUM TAPER STRIP FLASK

the mold, and as the bottom board is used when the drag is rolled over, there is nothing to stop the drag section of the flask from lifting off. It is a very quick, easy and free removal of the flask when the mold is completed.

A choice is offered to the foundryman of three styles of pins: ¾-in. round and square; V-type; ⅝-in. round. Other variations can be made to order.

GLAZED CRUCIBLES

The New York Brass Foundry, New York, reports that the glazed crucibles made by the Joseph Dixon Crucible Company, described in THE METAL INDUSTRY for October, 1925, are still giving long runs. At that time records were made of 195 heats and 275 heats on two crucibles melting various types of brass.

Equipment and Supply Catalogs

Car Wheel Grinding. Norton Company, Worcester, Mass.

Frictionless Metals. Frictionless Metal Company, St. Louis, Mo.

Hardinge Super Thickener and Clarifier. Hardinge Company.

Motor Fuel. Kansas City Testing Laboratory, Kansas City, Mo.

Operation Notes for Ball Mill Users. Hardinge Company, York, Pa.

Rubber Respirator. Hanson & Van Winkle Company, Newark, N. J.

Special Machinery. Steacy-Schmidt Manufacturing Company, York, Pa.

Meakerite and Brightening Salts. Meaker Galvanizing Company, Chicago, Ill.

Laboratory Sinks, Pipe and Fittings. U. S. Stoneware Company, Akron, Ohio.

Electric Power Apparatus. Ideal Electric & Manufacturing Company, Mansfield, Ohio.

The Homo Method for Tempering of Steel. Leeds & Northrup Company, Philadelphia, Pa.

Bulletin on Development of Testing Equipment. Adam Hilger, Ltd., London, England.

Crysteel Refrigerator Cabinets. Benjamin Electric Manufacturing Company, Chicago, Ill.

Lincoln Welder Instruction Manual. Lincoln Electric Company, Cleveland, Ohio. Price, $1.

Airco Davis-Bournonville Oxygen Manifolds. Air Reduction Sales Company, New York.

A. B. C. of Hydrogen Ion Control. LaMotte Chemical Products Company, Baltimore, Md.

A Revelation in Woven Metal-Metalace. Diamond Manufacturing Company, Wyoming, Pa.

Lansing, Mich., a Progressive American City. Lansing Chamber of Commerce, Lansing, Mich.

Profitable Profit-Sharing. Policyholders' Service Bureau, Metropolitan Life Insurance Company, New York.

Slyblast Tilted Mills for sand blast, shot blast or grit blast. W. W. Sly Manufacturing Company, Cleveland, Ohio.

Alloy Data Sheets, covering aluminum-bronze, bronze bushings, bronze bearings, etc. William H. Barr, Inc., Buffalo, N. Y.

Brushings. A house organ edited by William Feather and published monthly by the Ferro Enamel Supply Company, Cleveland, Ohio.

Chemical Engineering and Graduate Courses in Chemical, Metallurgical and Gas Engineering. University of Michigan, Ann Arbor, Mich.

Enamelers' Training Course. An outline of practical and theoretical study of the art of porcelain enameling. Ferro Enamel Supply Company.

ASSOCIATIONS and SOCIETIES

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

ALUMINUM BRONZE MANUFACTURERS' INSTITUTE

HEADQUARTERS, 810 18th STREET, WASHINGTON D. C.

Aluminum bronze is a non-ferrous alloy resembling steel in many of its physical properties. The differences between the two are chiefly those of composition and resistance to corrosion. This metal, therefore, can be used in place of steel for many structural parts with but little, if any, change in design or method of working. In addition, aluminum bronze has wear-resisting properties which have proved to be of value in worm wheels and bearings.

Many manufacturers of alloys have tried to make aluminum bronze castings and rolled products but have met with indifferent success principally because of their lack of information about the alloy itself, usually concerning the technique and handling. It has now been demonstrated that the most improved manufacturing methods must be followed if the engineer and consumer are to be assured the advantage of the well known valuable properties of aluminum bronze.

Therefore, a group of prominent manufacturers of aluminum bronze have formed an organization for purposes of research and this organization will be known as The Aluminum Bronze Manufacturers' Institute.

A central office, or headquarters, has been opened in Washington, D. C. The member companies of the Institute are:

American Metal Products Company, Milwaukee, Wisconsin; Buffalo Bronze Die Cast Corporation, Buffalo, New York; Duriron Company, Dayton, Ohio; Hills-McCanna Company, Chicago, Illinois; The Michigan Smelting and Refining Company, Detroit, Michigan.

The Director of the Institute is W. M. Corse, Metallurgical Engineer, Washington, D. C. Mr. Corse has been connected with the aluminum bronze industry in this country since its inception.

Through co-operative advertising, research and development the Institute plans to establish the reputation and increase the use of aluminum bronze as a reliable, first-quality engineering material.

The central office will serve as a clearing house for distributing information on the uses and properties of this valuable metal. Every engineer knows how difficult it is to secure accurate information regarding the right metal or alloy for a particular purpose. It is the desire of every manufacturer of repute to furnish correct data, because a good alloy used under wrong conditions reacts only to his disadvantage.

It is one of the objects of the Institute to serve as a source of information between engineer and manufacturer, and it is hoped that the engineer in search of authentic information on aluminum bronze will take advantage of and be aided by the facilities offered.

FOUNDRY EQUIPMENT MANUFACTURERS

HEADQUARTERS, CARE OF H. COLE ESTEP, WEST 3rd AND LAKESIDE AVENUE, CLEVELAND, OHIO

At the annual meeting of the Foundry Equipment Manufacturers' Association, at Cleveland, Feb. 1, Thomas W. Pangborn, Pangborn Corporation, Hagerstown, Md., was elected president. S. C.

Vesey W. W. Sly Manufacturing Company, Cleveland, was chosen vice-president, and H. Cole Estep, West Third and Lakeside Avenue, Cleveland, was reelected secretary-treasurer. E. O. Beardsley, Beardsley & Piper Company, Chicago, and N. S. Lawrence, Whiting Corporation, Harvey, Ill., were elected directors for three years from Feb. 1.

WASTE MATERIAL DEALERS

HEADQUARTERS, TIMES SQUARE BUILDING, NEW YORK

The Metal Division, of which George Birkenstein of Chicago is chairman, anticipates holding a very well attended meeting on Tuesday afternoon, March 15th, at 2 o'clock. The meeting of the Metal Division will immediately follow the members' luncheon and will be held in the same room immediately following the serving of the luncheon. All members of the Metal Division are urged to attend this important meeting.

CHICAGO BRANCH, A. E. S.

HEADQUARTERS, CARE OF ROBERT MEYERS, 2432 WILSON AVENUE

January 29th, 1927, saw another milestone passed in the history of Chicago Branch, American Electro-Platers Society, the day of their 15th Annual Banquet and Educational Meeting in the Red Lacquer Room of the New Palmer House, Chicago, Illinois. It was a most successful event. Much credit is due to H. A. Gilbertson, Chairman of the Committee and his efficient company of workers and Committee men; R. J. Hazuck in charge of Publicity; E. Lamoureux in charge of Arrangements; O. E. Servis and F. J. Liscomb in charge of Educational Program, and Robert Meyers, Printing and Reservations, President Hay, S. E. Huenerfauth, Nathan Hunter, J. P. Manz, H. Magnus and F. J. Hanlon, General Committee, and the many members of the reception committee also did excellent work.

The educational program started promptly at 2:30 P. M. with Past Supreme President O. E. Servis presiding and about 150 members, visitors and visiting members in attendance. The papers were read by C. Nixon of Western Clock Company, Peru, Illinois, F. R. Porter of Edison Appliance Company, and Dr. O. P. Watts, who was unable to be with us but sent his paper. This session also had pleasure of presence of our founder, Charles H. Proctor, who has not been with us for quite some time. He spoke on Rust-proofing of Steel and Black upon Zinc.

H. A. Gilbertson spoke on the Corrosion of Silver Deposits and F. T. Taylor spoke on Plating Room Control.

Chairman Servis is to be congratulated for his excellent work at this session in presiding at these Educational Meetings.

It was a great pleasure to stand in the foyer and witness the arrival of the different members and their families; Milwaukee Branch with twenty-five percent of its members, and several ladies; Detroit, Grand Rapids, Bridgeport, St. Louis, Cleveland, Indianapolis, New York and Newark. Some of these notables, were in the Milwaukee delegation, Supreme Vice-President Stuernagel, President Goodsell, Joseph Bykowski, Jack Geisman, A. E. Shepherd of Flint. St. Louis had Frank Terrio; Grand Rapids, Past Supreme President and Editor W. J. Allen, Albert Barrows of Kalamazoo; Cappie Taylor of New Jersey,; Messrs. Tannert, Whitson and Proctor of New York; MacKeon the sulphur man from Pittsburgh and John Oberender of Bridgeport, Conn. There were noted many Chicago Branch, out of town members such as Martin Dunz and Mr. Hoenscheid of Peru, Illinois, the Howards of Elgin,, Ill., the L. Shaws of Freeport Ill., the Hay's of Kenosha, Wisconsin, and many others.

The entertainment started with songs by Miss A. Clansen, and dancing by French Dresden Doll. It wound up with a very versatile act by the Tripoli Trio, very appropriate.

Last but not least it is with a real respect that we call your attention to the yeoman service of the secretary of Chicago Branch, Robert Meyers and his four assistants at the door, William Meggs, Oscar Smidel, J. P. Manz and J. C. Mopp. Mr. Meyer on duty from 1:30 P. M.

F. J. HANLON.

NEWARK BRANCH, A. E. S.

HEADQUARTERS, CARE OF ROYAL F. CLARK, P. O. BOX 201

The Newark Branch will hold its Ninth Annual Banquet and Educational Session on April 30, 1927, at Achtel Stetters Hall, 846 Broad Street.

Information can be obtained from the secretary at the address noted above.

INTERNATIONAL FELLOWSHIP CLUB

HEADQUARTERS, CARE OF R. HAZUCHA, 1115 WASHINGTON BOULEVARD, CHICAGO, ILL.

A meeting of the International Fellowship Club was held at a luncheon at the Aldine Club, 200 5th Avenue, New York, on February 19, 1927. The Code of Ethics was discussed and recommended for adoption at the annual meeting.

Personals

ORLANDO C. HARN

Orlando Clinton Harn, advertising manager of the National Lead Company of New York, won the first prize gold medal under the Bok Awards for distinguished work in advertising in 1926.

ORLANDO C. HARN

Mr. Harn was born in Dayton, Ohio, and educated at Ohio Wesleyan and Cornell universities.

His first business experience was as clerk in a book store. Upon graduation from college, became a reporter on the Cleveland Leader; later telegraph editor Cleveland Press, and agent for Scripps-McRae Press Association. He edited trade papers and went into advertising work with H. J. Heinz Company, Pittsburgh. Since 1905 he has been advertising manager of National Lead Company. He originated the now familiar "Dutch Boy" Painter trade-mark used by that company.

He was one of the organizers of the Association of National Advertising Managers, and was its second president; also for two terms president of the Technical Publicity Association. He was chairman for four years of the National Advertising Commission of the Associated Advertising Clubs of the World, an important body representative of all the advertising interests of the country. He was a member of the Executive Committee of the A. A. C. of W.; member of Board of Directors, Audit Bureau of Circulations, since its organization and served as its President for six terms.

Mr. Harn has devoted much attention to the co-operative advertising campaign of the paint and varnish industry, known as the Save-the-Surface Campaign, being a member of the Executive Committee which is conducting the campaign and chairman of its sub-committee on advertising.

Although Mr. Harn went to National Lead Company as an advertising man, he at once began studying the lead business in all its phases and this study resulted in his contributing two years ago to the literature of the metal the book entitled "Lead the Precious Metal." His most conspicuous work, however, continued to be in the field of advertising and on February 15, 1927, he was called to Cambridge to receive the Harvard School of Business Administration's gold medal awarded "for distinguished personal service rendered American commerce and industry through raising the standards of advertising."

On March 1, 1927, Mr. Harn severs his connection with Na-

tional Lead Company to become managing director of the Audit Bureau of Circulations, an organization of more than 1,900 newspapers, business papers, farm papers, magazines, advertisers and advertising agents, of which he had been president for more than six years. Mr. Harn takes up the work of the late Stanley Clague, whose death was noted in THE METAL INDUSTRY for February, 1927.

George H. Walsh has been placed in charge of the new office of the Dings Magnetic Separator Company, Milwaukee, Wis., recently opened at 304 Rice Building, Boston, Mass.

Charles U. Unterzuber has been appointed general manager of the Cleveland Nickel Works, and the Cleveland Chaplet and Manufacturing Company, Cleveland, Ohio. He served these interests in the capacity of assistant manager for twenty-two years. F. Hohlfelder Company, who are owners and operators of the above companies, also own and operate the Cleveland Elbow Company, and the Cleveland Copper Ferrule Company of which Mr. Unterzuber is also manager.

C. W. Coleman, who recently severed his connection with the Tabor Manufacturing Company, Philadelphia, has engaged in business on his own behalf at 10 Savoy street, London, England. Mr. Coleman served 31 years with the Tabor company, selling and demonstrating that firm's molding machines in America and Europe. He will handle various types of foundry equipment and also will represent the Pangborn Corporation, Hagerstown, Md.

Obituaries

ASA W. LA FRANCE

Asa W. La France died January 23rd at his home in Elmira, N. Y., at the age of 82 years. Mr. La France was one of the founders of the American La France Fire Engine Company, Inc., Elmira, becoming associated with that company in 1870. He retired from active business in 1905.

HAWLEY A. NEWKIRK

Hawley A. Newkirk, a pioneer brass manufacturer in the Middle West, died January 20 at St. Luke's Hospital, Chicago, Ill., aged 74 years. Mr. Newkirk was at one time an official of the Mississippi Brass Wire Company, Chicago, Ill.

J. W. JOHNSON

J. W. Johnson, long associated with the iron, steel and nonferrous metal industry, died recently in Kokomo, Ind., aged 58 years. Beginning work as a molder in one of the factories of which he later became the head, Mr. Johnson continued until he became the leader of seven successful businesses in Kokomo. They are: Byrne Kingston Company; Kokomo Electric Company; Kokomo Stamped Metal Company; Hoosier Iron Works; Malleable Iron Works; Kokomo Brass Works and the Kokomo Lithograph Company.

GEORGE M. LANDERS

George M. Lander died at his home in New York on January 26. Mr. Landers was formerly vice-president, secretary and treasurer, and a director of Landers, Frary and Clark, manufacturers of hardware and cutlery. He was at one time mayor of New Britain, Conn., and also served as president of the Connecticut Senate.

SHIRAS MORRIS

Shiras Morris passed away on February 2nd. He was president of Hart and Hegeman Manufacturing Company, Hartford, Conn., of which he was also treasurer and was also prominently identified with other Hartford industrial companies. Mr. Morris was a director of the Billings and Spencer Company, the Terry Steam Turbin Company, Bristol Brass Corporation, Sesamee Lock Company, the Sesecure Lock Company, Bush Manufacturing Company, and Peck, Stow and Wilcox.

WILLIAM H. ROBERTS

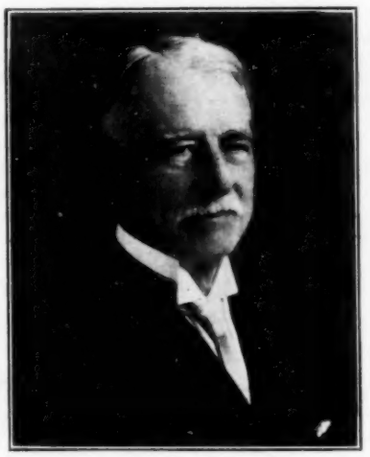
William H. Roberts, 48 years old, president of the Roberts Brass Manufacturing Company and the Detroit Stamping Company, Detroit, Mich., died suddenly at his home, 80 Longfellow Avenue, February 14, of heart disease. Mr. Roberts was born at Wallaceburg, Ont., Can. While he was a child his parents moved to Detroit, where his father, D. H. Roberts, founded the Roberts Brass Manufacturing Company, an industry into which his sons followed him.

His family includes his widow, Mrs. Gloria Roberts; two sons, Glendon, 21 years old, at present on the "University Afloat" on a world cruise, and William, Jr., 8, and a daughter, Virginia, 15 years old.

Four brothers, Earl W. Herbert, Lee and Russell, all connected with the Roberts company, his father, D. H. Roberts, and one sister, Mrs. F. W. Schmidt of Detroit, also survive. Mr. Roberts was active in Y. M. C. A. work, and clubs, and at the time of his death was chairman of that organization's activities on the West Side. He was a member of the North Woodward Congregational Church.

HENRY BRADFORD SARGENT

Henry Bradford Sargent, president of Sargent & Company, hardware manufacturers, of New Haven, Conn., died on February 3, 1927, after a short illness. Mr. Sargent was born March 4, 1851, in New York City. He was the eldest son of Joseph Bradford Sargent, founder and first president of Sargent & Company, and Elizabeth Collier (Lewis) Sargent, both of New England ancestry.



HENRY BRADFORD SARGENT

He prepared in the public schools of New Britain and New Haven, and graduated from Yale University with the Class of 1871. In the latter half of the year 1870 as an undergraduate, he spent six months on the plains west of the Mississippi River as a member of the Geological Exposition of Professor O. C. Marsh, in his successful search for theretofore undiscovered fossil remains of extinct vertebrates.

On graduating, he at once began work in the plant of Sargent & Company, his first position being that of General Inspector of Products, later becoming Assistant Superintendent. He was elected Vice-President in 1887 and in 1917 he succeeded George Henry Sargent as President.

Mr. Sargent took a keen interest in civic affairs, serving as a member of the local Board of Education and of the New Haven City Council. He was active in the work of the New Haven Community Chest and a member of its executive committee. He was also a director of the New Haven Bank, a member of the New Haven Chamber of Commerce, a former vice-president of the County Employers' Association and a member of the Franklin Institute at Philadelphia and of the American Society of Mechanical Engineers, of which he was vice-president for two years. He was a former member of the executive committee of the American Hardware Manufacturers' Association and of the American Hardware Manufacturers' Organization for War Service.

Mr. Sargent is survived by his widow, Harriet Amelia Oakes, to whom he was married December 4, 1879, by two sons, Ziegler Sargent, treasurer of the company, and Murray Sargent, secretary, and two daughters, Elizabeth Collier Sargent and Mrs. Rhoda Miles Tilney, both of Simsbury, Conn., also four brothers, Edward R., Joseph D., G. Lewis and John, all of whom are active in the Sargent organization, and four sisters.

NEWS OF THE INDUSTRY

Industrial and Financial Events

ALUMINUM BOND ISSUE

Public offering was made February 7, 1927, by a syndicate headed by the Union Trust Company of Pittsburgh of an issue of $60,000,000 of 5 per cent sinking fund debenture bonds of the Aluminum Company of America at 100 and accrued interest to yield 5 per cent.

Proceeds of the issue will be used partly for the redemption of the company's entire outstanding funded debt except the $1,000,000 par value 6 per cent notes due in 1934 on its subsidiary, the Franklin Fluorspar Company, which are not redeemable at the present time. The company will rid itself of a bank indebtedness of $5,500,000 which was incurred in the last four months in financing its building program. The company will effect a substantial saving in interest by replacing its present funded debt with the new 5 per cent issue.

TO FINANCE BUILDING PROGRAM

Funds remaining will be used for corporate purposes, part to be applied on the large building program which the company is now carrying out and which is expected to be completed by the end of next year. This program includes the building of dams and hydroelectric plants at Santeetlah and at Badin, N. C., and an aluminum smelting plant, ore plant and town at Arvida, Province of Quebec.

Arthur V. Davis, President, explained in connection with the bond offering that the company was established in 1888. It mines bauxite, smelts aluminum therefrom and fabricates it. The principal business is the smelting of aluminum from its ore. It has smelters at Niagara Falls and Massena, N. Y.; Alcoa, Tenn.; Badin, N. C.; Shawinigan Falls and Arvida, Province of Quebec, and in Norway. The hydroelectric plants that produce the 500,000 horsepower of energy required in the smelting are either owned by the company or the power therefrom is obtained under long-time leases.

The company also does a large fabricating business, producing aluminum sheet, rod, wire, tubes and castings. Mills for such operations are located at Alcoa, New Kensington, Pa.; Edgewater and Garwood, N. J.; Buffalo, Niagara Falls, Massena, Cleveland, Detroit, Fairfield, Conn.; Toronto and Shawinigan Falls. The company has its own bauxite mines in Arkansas, South America and several European countries. It also has a plant for the preliminary refining of bauxite at East St. Louis, Ill.

1926 INCOME $19,747,068

The net income of the company after taxes and depreciation available for interest has averaged more than $12,000,000 yearly and in the last three years it has been: 1924, $13,425,266; 1925, $22,891,505; 1926, $19,747,068. On the basis of present market prices the capital stocks of the company has a market value of more than $250,000,000.

The company announces that it will pay annually to the trustee a sinking fund as follows: On Jan. 1 in each year from 1929 to 1937, both inclusive, $1,000,000; on Jan. 1 in each year from 1938 to 1951, both inclusive, $2,000,000.

The issue and sale of the bonds are subject to the approval of stockholders to whom they will be submitted at a special meeting on April 11, 1927.

SCOVILL COMPANY EARNINGS

The Scovill Manufacturing Company report for 1926 shows net earnings of $2,979,701, after all charges and taxes, against $2,623,145 in 1925. Gross earnings from sales amounted to $4,124,564, against $4,112,695 the year before, and total income was $4,789,413, against $4,785,922.

Earnings realized amounted to $3.37 a share in 1926, based on 885,000 shares, against $14.82 a share in 1925, based on 177,000 shares, the $100 par stock having been split four ways and a 25 per cent stock dividend declared. Earnings for 1926 would be equivalent to $16.85 a share on the old stock.

NICKEL COMPANY STATEMENT

The International Nickel Company reports net earnings of $5,556,267 for 1926, after charges and taxes, equal after preferred dividends to $3 a share earned on 1,673,384 outstanding shares of $25 par common stock. The previous report, covering the last nine months of 1925, showed a net profit of $4,237,400, equal to $2.29 a share on common.

HECLA WORKS SOLD

The plant, equipment and land of the Hecla Iron Wroks, Brooklyn, New York, were sold at auction in February, 1927. High real estate values and sharp competition of concerns operating under lower fixed charges and other overhead combined to make it more profitable for the owners to sell out than to continue in business.

PROJECTED ROLLING MILL IN DAYTON

Information is being secured by the Dayton Industrial Association at the request of some people interested in a study of possibilities for a brass rolling mill in Dayton, Ohio. There is no positive action in that direction yet.

ALUMINUM STREET CAR

According to reports in the daily press, an all-aluminum street car was officially approved by the Cleveland Railway Company after a four month's test. Ralph W. Emerson, vice-president of the company, said one car used for the test had required 20 per cent less power than a steel car. It weighs 30 per cent less than the ordinary car, thus reducting track wear.

The car is the same size as the steel type, but it is constructed entirely of aluminum, with the single exception of the magnetic field in the motor. Even the wheels are aluminum.

PRIZE TO ROME WIRE COMPANY

A prize of $2,000 and certificate, awarded for the first time, for the best industrial advertising campaign seeking publicity through the mediums of industrial, trade, or professional journals, went to the Rome Wire Company of Rome, New York, and Moser & Cotins of Utica, New York, for the advertising of the Rome Wire Company products. The Jury felt these advertisements had attracted immediate interest to the various needs for wire and that the advertiser had overcome difficult problems in a dignified manner.

DURALUMIN RACING SHELL

A racing shell has been made for the Naval Academy crew out of aluminum alloy. It was built at the Naval Aircraft Factory, Philadelphia, Pa.

Duralumin was used for all structural parts including the outer skin, the skin being riveted to thin duralumin frames with contersunk rivets which give a flush outer surface. These rivets are countersunk in an outer skin which has a thickness of only .018". The duralumin used is ordinary duralumin sheet in a heat treated condition.

CADMIUM IN 1925

More metallic cadmium was produced in the United States in 1925 than in any other year since its isolation began in this country in 1906, according to reports made by producers of cadmium to the Bureau of Mines, Department of Commerce. The production at six plants amounted to 502,824 pounds, valued at $276,553, at the average selling price of 55 cents a pound.

Business Reports of the Metal Industry Correspondents

NEW ENGLAND STATES

WATERBURY, CONN.

MARCH 1, 1927

All officers and directors of the **American Brass Company** were reelected at the annual meeting of the company the first week of February. The officers reelected are: President, John A. Coe; vice-president, Edward L. Frisbie; treasurer, Clifford F. Hollister; secretary, Edmund H. Yates; assistant treasurers, S. Burnham Terry and Major W. Judge. No one was chosen chairman of the board, an office held by the late Charles F. Brooker, who died in December, and it is understood that the office will henceforth remain vacant.

The directors re-elected are: John D. Ryan, Cornelius F. Kelley and Benjamin B. Thayer, all of New York; John A. Coe, C. F. Hollister, E. L. Frisbie and Edmund H. Yates, all of Waterbury, and George H. Allen, of Buffalo, and Clarke S. Judd, of Kenosha, Wis. The latter was first added to the board of directors in January to succeed the late C. F. Brooker.

All last year's officers and directors were elected at the annual meeting of the **Scovill Manufacturing Company** held in the early part of last month and two new members were added to the board of directors. The officers reelected are: President, E. O. Goss; vice-presidents, John H. Goss, George A. Goss and Bennet Bronson; treasurer, Clayton M. DeMott; secretary, Leavenworth P. Sperry; assistant treasurers, F. J. Gorse and William Goss; assistant secretaries, T. G. Myers, B. P. Hyde, C. F. Doherty and W. W. Bowers.

John P. Elton and Bennet Bronson were added to the board of directors, which besides them consists of: E. O. Goss, J. H. Goss, C. M. DeMott, L. P. Sperry, Chauncey P. Goss, F. J. Kingsbury, W. S. Fulton, G. A. Goss and Roger S. Sperry.

Mr. Elton's addition to the board is of interest inasmuch as he was formerly an officer and heavily interested in the American Brass Company and its predecessor, the **Waterbury Brass Company.** His father, James S. Elton, was president of the Waterbury Brass Company and an officer of the American Brass Company. John P. Elton was vice-president of the American Brass Company until after its absorption by the Anaconda Copper Mining Company. Soon after that he resigned. He is also president of the **Blake & Johnson Company,** which recently sold the business of its machinery division to the **Torrington Manufacturing Company. Bennet Bronson** was president of the **Oakville Company,** recently acquired by the Scovill Company. Since its absorption he has been a vice-president of the latter company but not a director until now. George A. Goss, who was reelected a vice-president of the company at last month's meeting, was first elected to that office during the past year to succeed **T. I. Driggs,** former president of the American Pin Company, now a part of the Scovill Company.

The **American Brass Company** broke all previous records last year in the production of fabricated brass and copper products. Its plants, including the Anaconda rod and wire mill at Great Falls, shipped 800,000,000 pounds during the year compared to 743,000,000 in 1925.—W. R. B.

BRIDGEPORT, CONN.

MARCH 1, 1927

Nearly 100 sales representatives of the **Bridgeport Brass Company** from as far west as the Pacific coast and as far south as New Orleans met here for a three-day conference, February 12-14, 1927. Curtis Baker, sales engineer of the company, was in charge. Addresses were made by President Carl F. Dietz, Sales Manager Warren D. Blatz and Harold Bates at the first session. Other addresses the first day were: Lewis Grout, on flush valves; William Baulieu, on white metal vs. chromium plate, followed by a discussion; Stephen Hackley, on tubular plumbing goods.

On the second day, William R. Webster spoke on research work, Alan Morris, on Polumrite brass pipes, and John L. Christie, on metallurgical problems encountered in brass pipe manufacture. History of Bridgeport fittings and how to interest the jobber and plumber was the subject of a talk by Curtis Baker, and producing brass fittings to meet plumbers' demands by Wirt Seeley, vice-president and general manager of the **Albrass Company.** On the third day, R. I. Neithercut, secretary of the concern, gave a 15-minute inspirational talk. Henry Burr, service manager, talked on building supplies' service division. Walter R. Clark, general works manager, on fabricating department betterment plans, and Harold

BRIDGEPORT SALES REPRESENTATIVES

Bates, on statistical records and aid to salesmen, budget and quotas. Alfred D. Guion spoke on advertising activities and Howard Knight, treasurer and general manager of the **Livermore & Knight Company,** of Providence, spoke on building supplies' advertising campaign. All departments of the plant were inspected.

The **Power-Way Manufacturing Company,** of Brooklyn, has leased the old **Feeney Tool Company** plant on Central avenue. The new concern manufactures power motors for household use which are operated by water from the faucet and many other attachments for performing general kitchen and household functions. Machinery has been moved here from Brooklyn and a force of about 25 men and women put at work. This force will be increased to 75 shortly, it is said. Irving Cummings is president of the company.

The **Atlas Warehouse, Inc.,** have leased a large part of the American-British plant on Crescent avenue, once one of the plants of the **Columbia Graphophone Company.**

Prince William of Sweden visited Bridgeport last month and inspected the plants of the **Bridgeport Brass Company, Singer Sewing Machine Company, General Electric Company,** and others.—W. R. B.

TORRINGTON, CONN.

MARCH 1, 1927

John A. Coe, president of the **American Brass Company,** was elected president of the **Hendey Machine Company** at the annual meeting last month. He succeeds **Charles H. Alvord,** resigned. **Clark G. Bennett** is vice-president; **Sterry H. Childs,** treasurer, and **Frederick N. McKenzie,** secretary. The directors are Messrs. Coe, Bennett, Childs, Charles H. Alvord, Frederick W. Fuessenich, W. Shirley Fulton and Charles S. Palmer.

The **Torrington Company** has transferred the business of its Manchester, N. H., plant from Manchester to Torrington.

The principal manufacturing concerns of Torrington are assessed as follows in the new city grand list just completed: **American Brass Company,** $3,881,169; **Union Hardware Company,** $1,030,771; **Hendley Machine Company,** $980,902; **Torrington Company, Excelsior** plant, $959,570; **Hotchkiss Brothers Company,** $380,933; **Turner & Seymour Manufactur-**

ing Company, $367,421; **Warrenton Woolen Company,** $358,350; Torrington **Manufacturing Company,** $344,542; **Progressive Manufacturing Company,** $256,303; **Fitzgerald Manufacturing Company,** $131,290. Total grand list is $28,674,073, an increase of about $700,000 in a year.

James **H. Wilson,** aged 70, for nearly 40 years employed at the Union **Hardware** plant, died February 21. Death was sudden, due to heart disease. For over 36 years Mr. Wilson was a buffer and finisher of nickel work.—J. H. T.

NEW BRITAIN, CONN.

MARCH 1, 1927

Except for the usual seasonal decline and that annual slackness which comes around the inventory period, New Britain's industrial concerns are keeping well up with their average of production and employment. There is very little unemployment in this city and among skilled labor there is practically none, all of the concerns finding ample work for such employes. As the winter lags and signs of spring appear there likewise appears a slight increase in sales reports, indicating that building operations contemplated this season will have a healthy reflection here.

At the present time, the outlook for early spring business is excellent, with no signs of depression or halting in conditions noticeable.

At the annual meeting of the **Landers, Frary & Clark Company** on February 18, 1927, **Judge E. B. Bennett,** of Hartford, was elected a director to fill the vacancy left by the death of **George M. Landers,** a director for over 30 years, a grandson of the founder of the plant and manager of the New York office. Mr. Bennett is also a director of the **Terry Steam Turbine Company.** The only change in the official personnel of the concern was the election of **Harold Parsons** as a vice-president and **Paul Guiberson** as assistant secretary. Mr. Parsons is sales manager of the electrical appliance division. **Charles F. Smith** again heads the directorate and **A. G. Kimball** again is president.

The directors have declared the usual quarterly dividend of 3 per cent, payable March 31.—H. R. J.

MIDDLE ATLANTIC STATES

ROCHESTER, N. Y.

MARCH 1, 1927.

With the month of February concluded a survey of the industrial situation in Rochester does not reveal anything new or promising in the way of an increase in business activities. It is generally admitted in nearly every plant throughout the city that operations have been sharply curtailed since the holidays, and that none show anything in the way of increased output thus far this year. An exception, of course, exists at the big plants of the **General Railway Signal Company,** which is running at full speed with railroad equipment orders that promise to carry through the entire year.

Among the brass foundries about the city business is very slack. Hope is entertained by the independent brass foundrymen that a renewal of building this coming spring will infuse new energy into the trade and bring about the re-employment of scores of brass workers who have been more or less idle since Christmas week last.

The electro-plating industry has lagged somewhat this winter, in marked contrast to keen activity that existed a year ago. However, managers of shops about the city anticipated a sharp trade revival with the appearance of spring.—G. B. E.

NEWARK, N. J.

MARCH 1, 1927

Appointment of **Arthur T. Vanderbilt** as Chancery receiver for the **Garod Corporation,** Belleville, N. J., radio manufacturers, has been made permanent by Vice Chancellor Church at Newark despite the fact that the company's affairs are in the hands of **Isaac P. Rodman,** equity receiver in the Federal Court.

Following Newark concerns have been chartered; **Lion Ware Company,** household, utensils, $500,000; **National Electric Products Corporation,** 200,000 shares, manufacture electrical articles; **Spartan Electric Corporation,** $50,000, manufacture electrical appliances; **Albert T. Blackburn, Inc.,** manufacture lamps, 2,500 shares no par value; **Marshall Manufacturing Company,** manufacture jewelry, 1,000 shares no par value; **Sunray Lamp Company, Inc.,** manufacture lamps, 1,000 shares; **Gem Jewelry Manufacturing Corporation,** manufacture jewelry, $50,000.—C. A. L.

TRENTON, N. J.

MARCH 1, 1927

The metal situation in this city is not very good at the present and manufacturers are hoping that business will pick up beginning with the early spring. The decline in business is attributed somewhat to a falling off in the pottery line. Trenton, the second largest pottery center in the United States, furnishes plenty of work to the metal plants. Recently, the business began to drop off and this greatly affected the metal manufacturing establishments.

The **Trenton Emblem Company** reports business as being far below normal, but the concern is expecting many orders for metal markets in the early spring. The **Skillman Hardware Manufacturing Company** is running to normal capacity, but reports orders as coming in very slow. The larger Trenton plants report similar conditions.

The **John A. Roebling's Sons Company** is making preparations for the erection of a large office building on South Broad street, to cost $300,000. The structure will be an addition to the present office building. Hodggson Brothers, of New York, are the architects.

The following concerns have been chartered here: **Clinton Manufacturing Company,** Camden, N. J., brass valves, $50,000; **Miller Radio Company,** Paterson, N. J., $100,000; **J. T. Hutchings, Inc.,** Bloomfield, N. J., sanitary fixtures, $100,000. **Corona Corporation,** Jersey City, N. J., electrical fixtures, $500,000. **Richard P. Luster, Inc.,** Verona, N. J., plumbing supplies, $100,000. **Brunswick Metal Novelty Company,** metal novelties, New Brunswick, $50,000. **Lyralite Corporation,** manufacture lamps, Bayonne, N. J., $50,000. **Alwin K. Schubert, Inc.,** Garwood, N. J., tin ware, $125,000.—C. A. L.

PITTSBURGH, PA.

MARCH 1, 1927

Business conditions in the metal industries in Pittsburgh and throughout Western Pennsylvania still remains somewhat spotty, some lines are reporting fair sized increases in business, while others are seasonably dull, and still others are reporting large increases in their orders during February.

Manufacturers of electrical and radio equipment continue to be fairly busy. Better sales of sanitary equipment are reported. Hardware trade is seasonably quiet.

The **Sangamo Electric Company** announces the appointment of **Reginald Mortimer Campbell** as eastern district manager in charge of watt-hour and ampere-hour meters and electric clock sales. Mr. Campbell has been associated with the electrical industry for 20 years. The past two years he has been special representative in the New York territory for the Sangamo Electric Company.

In a display arranged for "Know Pittsburgh Week" campaign, the growth of the **Aluminum Company of America,** a Pittsburgh concern, and the widespread uses of its products are depicted. The display is erected in the main banking rooms of the Union Trust Company of Pittsburgh, as the company's contribution to the exhibits. An oil painting, **"The Spirit of Aluminum,"** by **Percy F. Albee,** occupies a prominent position in the display.

The exhibit shows that while cooking utensils are an important factor in the Aluminum industry, they are overshadowed by the uses in the automobile industry and the making of electrical conductors and radio and chemical apparatus and many other lines. More than 200,000 miles of aluminum cable made by the Pittsburgh company are now in service in the electrical industry.—H. W. R.

MIDDLE WESTERN STATES

CLEVELAND, OHIO

MARCH 1, 1927

Metal plants in Cleveland increased their forces 8.5 per cent during January, figures made public by the Chamber of Commerce committee on labor relations reveal. Employment conditions will continue to improve during February, the committee reported.

The **Cleveland Board of Education** is considering construction of a foundry addition to **Eagle Trade School**, suggested by **William Frew Long**, manager of the **American Plan Association**, and a committee of foundrymen connected with the association.

The foundry will be equipped with modern machinery by the association. The committee named to co-operate with school officials includes: Tracy Calhoun, Johnston & Jennings Company; George Stanley, United States Aluminum Company; George Hemmink, Wellman Bronze Company; W. H. Shilling, Atlas Foundry Company; E. F. Grundie, Kilby Manufacturing Company; W. J. Strangwart, Walworth Run Foundry Company; Daniel Gluntz, Gluntz Brass & Manufacturing Company, and R. H. West, West Steel Castings Company.

In enlarging its space, the **Braden Plating & Manufacturing Company**, 1895 W. 98th street, Cleveland, has taken a five-year lease on a building containing 9,000 square feet of floor space, at 1478 W. 110th street. Rental is $6,000 a year.

Alterations will be made on the plant at Shaw avenue and E. 128th street, recently purchased by the **Atlas Wire Company**, to enlarge its business. An addition will also be erected.

The **Angell Metal Embossing Company** has started operations at Dayton, Ohio. Name plates, insignia, embossed advertising novelties and checks are turned out by the company. A modern plating department is operated along with the plant in the **Barney & Smith** shops. Capacity at present is 50,000 plates a day. **R. H. Angell** is president.

The **Forest City Plating & Manufacturing Company**, Cleveland, incorporated for $10,000 includes: J. Bannish, J. Ziegler, J. Pfaff, F. Pfaff and George Bauerle.

Corporation papers have been issued to the **American Copper & Brass Works, Inc.**, Cincinnati. Capitalization is $75,000. Incorporators are: Walter Schmitt, C. F. Ellerhorst, E. A. Ellerhorst, E. M. Hughes and G. E. Pinney.—S. D. I.

DETROIT, MICH.

MARCH 1, 1927

The **Universal Electro Plating Company** has recently been incorporated in Detroit for the purpose of dealing in plating machinery and plating materials. The owners are Morris Tuchbant, Frank J. Hardy and Meyer Ginsburg, 2982 Calvert avenue, Detroit.

The **Macklin Company** has recently been incorporated at Jackson, Mich., with a capital stock of $250,000, for the purpose of manufacturing grinding wheels and abrasives. Construction of the first unit of a new plant has already been started. It will house three fifteen-foot kilns and electric equipment for the manufacture of wheels. The following make up the organization: T. J. McIntyre, president; B. F. McIntyre, vice-president; C. H. Franklin, secretary-treasurer; O. H. Schulz, Charles T. Cline and Carl H. Lawson. T. J. and B. F. McIntyre have been associated with the industry for many years, having been identified with the Carborundum Company and the Waltham Grinding Wheel Company. C. H. Lawson, ceramic engineer, will have charge of the plant.

Michigan manufacturers are interested in the effort to create a minimum wage commission in this state, similar to that established in New Hampshire. Under the plan, all factories of the state would be regularly inspected and their records checked. They also would be forced to file reports with the commission as to age and wage of each employe, and the commission could order wage adjustments.

Toledo, the third city in Ohio and as every one knows a great manufacturing center, will be asked to join with other cities of the state to take part in a big industrial exposition at Cleveland from August 5 to August 28.

More than 50,000 persons are expected to attend the manufacturers' and distributors' exhibition which is to be held at Findlay, Ohio, the week of February 21.

Electro-platers of Detroit, Cleveland and Toledo even at this early date, are planning and looking forward to the convention of the American Electro-Platers' Society which will be held in Toledo during the latter part of June. These three great Lakes cities are among the leaders in this industry due largely, of course, to the motor car, adding machine and stove manufacturing industries which are so numerous in this territory.—F. J. H.

INDIANAPOLIS, IND.

MARCH 1, 1927

The **Adams & Westlake Company**, which has been located in Chicago since 1867 and which manufacturers ship hardware, accessories, railway signal lamps and railway car fixtures, is to vacate its property there and will move its entire plant to Elkhardt, Ind., it has been announced by Thomas W. Holt, general manager. The company employes 900 persons and is capitalized at $4,500,000. **Ward Willets**, president of the company, said the decision to move to Elkhardt was made because the Chicago company owns a one-third interest in the Curtain Supply Company of Elkhart and because the two are so closely related, their plants should be combined. The company's site in Ontario street, Chicago, Mr. Willets said, is valued at $500,000 and is too valuable to be used for industrial purposes. Lower tax rates also were a factor, he said. He estimated the cost of moving and constructing a new plant to be $800,000. The company expects to be in full operation in Elkhart by the fall of 1927.

Purchase of the plant and real estate of the **Enterprise Foundry Company**, of Indianapolis, has been announced by **Charles J. Gisler**, president and general manager of the **C. & G. Foundry and Pattern Works**, also of Indianapolis. The plant acquired, Mr. Gisler said, will be overhauled and put into full operation within sixty days, providing employment for about 100 men to start. It has been closed a year. The purchase included approximately 2.3 acres of land. The new plant will be operated as an iron foundry in connection with the Kentucky avenue plant of the C. & G. company, which manufactures brass, bronze and aluminum castings and wood and metal patterns. The consideration of the purchase was not given.

The contract has been awarded and work will begin shortly on a foundry building for the **Universal Brass Works**. The building will cost, exclusive of equipment, about $30,000 and will be of brick and hollow tile construction. It will be 63 by 102 feet in dimensions.

Plans are being drawn for the construction of a foundry building for the **B. & F. Manufacturing Company** of Indianapolis, manufacturers of plumbers' supplies. The building, exclusive of equipment, will cost about $45,000 and will be one story high, 60 by 110 feet.

Alfred G. Morency, former manager of the **Morency-Van Buren** branch of the **Scovill Manufacturing Company**, Waterbury, Conn., at Sturgis, Mich., has purchased an interest in the **Northern Indiana Brass Works**, Elkhart, Ind., and has been elected president of the company.—E. B.

CHICAGO, ILL.

MARCH 1, 1927

The brass and copper industry in the Chicago and Milwaukee district has maintained a very even tone throughout the last month and everyone in the business seems to think that this will continue for the next sixty days or so.

One of the large jobs in Milwaukee for which brass manufacturers are competing is the contract to furnish the city of **Wauwatosa**, a suburb, for corporation cocks, curb stops, meter stops and meter couplings, for their new water system. Bids will close March 1, 1927.

The **Badger Metals Company**, located at Milwaukee, and dealing in brass, copper, gold plating and aluminum has announced its dissolution.

The **Kewaskum Aluminum Company**, Kewaskum, Wis., will build a $20,000 addition to its plant, it has recently been announced by A. L. Rosenheimer, president. It will be a two-story, 50 x 80 ft. building.

George **A. Rosenhauer** and **H. A. Sagemuhl** have established a new metal plating company at Random Lake, Wis., which is called the **Ideal Metal Plating Works.** They have installed complete equipment for plating and refinishing gold, silver, nickel, copper and bronze metals.

The **Kenosha Metal Company,** has been incorporated at Kenosha, Wis., and will deal in metals of all kinds. Incorporators are Louis Adams, Max Mostove and Joseph Ruppa.

The **Hudson Metals Products Company,** 120 N. Green St., Chicago, has been incorporated for $20,000 and will manufacture and deal in metals and metals products. Incorporators are: Edward J. Hudson, John T. MacMahon and Emma Hudson.

The **Royal Metal Manufacturing Company,** now at 2318 South Western avenue, Chicago, has bought five acres at Michigan City, Ind., and has begun work on a one-story plant.

The **J. E. Burke Company,** of Fond du Lac, Wis., manufacturers of metal products, will open a branch sales office at Wisconsin Rapids, Wis.

The **Apex Manufacturing Company** is the name of a new plant, manufacturing aluminum products which will be located at Three Lakes, Wis.

A $45,000 factory building will be built at Rockford, Ill., by the **J. S. Heath Company,** manufacturers of brass and bronze products, according to an announcement given forth by R. O. Alexan, manager.—A. P. N.

OTHER COUNTRIES

BIRMINGHAM, ENGLAND

FEBRUARY 14, 1927.

In order to show the competition British makers have to meet in aluminum hollow-ware, the Department of Overseas Trade recently organized an exhibition of domestic aluminum articles of Swiss and French origin. This was held in the Chamber of Commerce, Birmingham and its object was to stimulate British trade in countries in which the foreigner to a certain extent holds the market. A local manufacturer after viewing the articles expressed the view that British manufacturers could make the goods equally as well as the French and Swiss. A feature of the goods shown was that they were not so heavy in the main as those supplied to the British market and various devices have been introduced not commonly resorted to by the British manufacturers. Among the Swiss made articles for the Argentine market are coffee pots with detachable insulated handles. Among the French ware for the Egyptian market are frying pans with wooden handles and other culinary articles. Foreign competition is considered to be very serve by the British makers. The aluminum trade is essentialy a post-war industry and the foreigner has shown great keenness for the business. The foreign article is certainly not better in quality than that made in the Black Country, but the goods are brought direct to the notice of the domestic user who will generally buy if the price is cheaper. So far the British maker has been unsuccessful in obtaining relief under the Safeguarding of Industries Act.

Electroplate makers find trade rather quiet, particularly in the cheaper class of goods. A good business is still done with railway companies and hotels who buy heavy stocks of electroplate. The trade has been hit, however, by the fashion for table ware in cut glass which has in many cases replaced electroplate in table ware. In the overseas markets severe competition is met with in South America against the German article, and in Australia the efforts to create home industries has had an adverse effect on the importation of British goods, except in semi-finished materials on which a considerable saving of duty is made as compared with the finished article.

The general metal trades have not shown the improvement anticipated when the year opened, but there is certainly more activity than a month ago. Rollers of brass and copper sheets have fair contracts in hand and the business in condenser tubes is fairly satisfactory. As in the heavier trades buying is confined to immediate needs. Expansion of output has been restricted through the high prices of fuel which, although showing a reduction as compared with the price at the end of the strike, is still very far from the levels before the stoppage in May. Rolled brass has been reduced ¼d per lb. and copper sheets by £2 per ton, but these reductions have not led to much expansion in buying.

The British Industries Fair was held in Birmingham and London from February 21, 1927, to March 4, 1927, and was the most successful in the history of this exhibition. The total area covered by the exhibits was 40,000 square feet and 215 more firms than last year have announced their intention of exhibiting. The Birmingham Section held at Castle Bromwich comprised exhibits from the following trades and industries: Brass foundry, hardware, ironmongery, metals (excluding precious metals), construction (building and decoration), power plant for lighting, heating, cooking and ventilating, engineering, foundry appliances, railway and municipal plants, mining, electrical equipment accessories, motor cycles, guns and agricultural and horticultural machinery.

—J. H.

Business Items–Verified

McKesson & Robbins, manufacturers of chemicals, have moved from 31 Union square, New York, to 79 Cliff street, New York.

The **Chemical Catalog Company, Inc.,** will move its offices on February 19 to new and enlarged quarters at 419 Fourth avenue, at 29th street, New York.

The **Lewin Metals Corporation,** 1-39 Branch street, St. Louis, Mo., plans the construction of a plant, estimated cost $500,000. This firm operates a smelting and refining plant.

The **Abendroth Brothers Company,** at Port Chester, N. Y., have placed contract for a complete porcelain enameling department, with the Ferro Enamel Supply Company, of Cleveland, Ohio.

The **Cincinnati Copper Works,** Cincinnati, Ohio, recently organized, will operate a plant at 1720 Central avenue. This firm operates the following departments: brazing, tinning, soldering, polishing.

One of the indications of the extent to which the Bolivian tin industry has grown is the fact that **Simon Patino,** head of the **Patino Tin Mines** in Bolivia, is listed among the world's wealthiest men, being rated at $100,000,000.

After a fire, the **Syracuse Plating Works,** 315 East Water street, Syracuse, N. Y., are taking care of their customers by having made temporary arrangements. They are re-building and expect to start up in from five to six weeks.

The **Tiffin Art Metal Company,** Tiffin, Ohio, has purchased a factory property in Toledo, which eventually means the removal of the local plant to that city. It is stated that no immediate removal of the factory is contemplated.

The Lion Electric Manufacturing Company, Inc., New York, has moved to a new factory at Stagg street and Morgan avenue, Brooklyn, N. Y. The building is 4 stories, 90 ft. x 215 ft. This firm manufactures a complete line of lighting fixtures.

The **Star Metal Manufacturing Company,** 525 North Ninth street, Philadelphia, Pa., is having plans drawn for a one-story addition and improvements in the present factory. This firm operates the following departments: spinning, plating, japanning, soldering, polishing.

Arrangements have been made with the **Hanson & Van Winkle Company** of Newark, N. J., by which their New York warehouse and stock located at 100 Walker street, New York City, were taken over by the **Boissier Electric Corporation** as of March 1, 1927. The telephone numbers will be Canal 8921 and 8922.

E. Reed Burns & Sons, Inc., 1811 Carroll avenue, Chicago, Ill., with home offices in Brooklyn, N. Y., announce that E. H. Myers became branch manager and district representative for their Chicago plant in January. Louis Kampelman, who is well known to the trade in and around Chicago, is now cov-

ering the States of Illinois, Indiana and Missouri for that house.

The **Bodine Electric Company,** 2254 West Ohio street, Chicago, Ill., manufacturer of electrical equipment and supplies, is completing plans for two additions, one- and two-stories, 29 x 50 ft., and 95 x 121 ft. It is expected to ask bids on a general contract in about a month. This firm operates the following departments: tool room, grinding room, japanning, stamping.

The **Rome Brass and Copper Company,** Rome, N. Y., will erect a new building in addition to its plant at Riverdale, known as the East Mills. It will be a sheet copper rolling mill and will contain 160,000 sq. ft. of floor space, the construction to be of steel and brick. The Bouck street mill will be either razed or used for some other purpose.

Joseph Feldman has retired as vice-president, director and stockholder of Wallstein Industrial Corporation, 230 Fifth avenue, New York, thereby terminating all connection with them. It is understood that he will continue in business, manufacturing celluloid and metal specialties, and has organized a corporation for that purpose, to be known as **Feldman Products Company, Inc.**

The **American Cyanamid Company,** New York, announces that on and after February 21, 1927, the New York offices will be located in the New Central Mercantile Bank Building, 535 Fifth avenue at 44th street. This removal will also include the offices of the associated companies, American Cyanamid Sales Company, Air Nitrates Corporation, Amalgamated Phosphate Company, Fumigators Supply Company, Owl Fumigation Corporation.

The **National Gauge and Equipment Company,** La Grosse, Wis., ownership of which recently was acquired by the **Moto Meter Company,** Long Island City, N. Y., has completed a manufacturing addition increasing the capacity nearly 100 per cent, and has enlarged the working force from 800 to 1,300. Operations are now at capacity. This firm operates the following departments: brass foundry, tool room, plating, japanning, stamping, tinning, soldering, polishing, lacquering.

The **Fuller & Warren Company,** Troy, N. Y., one of the oldest manufacturers of stoves, recently placed contract with the Ferro Enamel Supply Company, of Cleveland, Ohio, for a complete and up-to-date porcelain enameling department. Electric enameling furnace will be used, and also latest type sheet steel and cast iron porcelain enameling equipment throughout. E. R. West will probably have charge of the new enameling plant.

The **Robeson-Rochester Corporation,** 176 Anderson avenue, Rochester, N. Y., has acquired from the Progressive Foundry Company an 18-acre industrial site on the north side of Buffalo road, and a modern factory will be constructed there within the coming year. The comany manufactures cutlery, household commodities and electric table utilities. The building to be erected on the new site will be constructed in units, the first one to contain approximately 150,000 sq. ft.

The **Hill Clutch Machine & Foundry Company,** Cleveland, Ohio, recently appointed Charles C. Phelps, 473 Getty avenue, Paterson, N. J., as sales engineer for the Metropolitan New York and northern New Jersey district. The manufacture of the Hill Clutch Machine & Foundry Company includes everything for power transmission such as shafting, couplings, bearings, clutches, pulleys, sheaves, belt tighteners, speed transformers, agitators, gears and sprockets.

All officers and directors of the **Lumen Bearing Company,** Buffalo, N. Y., bronze and brass founders, re-elected at the annual meeting of stockholders, February 10. The officers are: Noah F. Young, president, general manager and treasurer; C. H. Bierbaum, vice-president, and Nathaniel K. B. Patch, secretary. Directors, in addition to the above named are: A. G. Bartholomew and Samuel Ellis. Mr. Young reports that since the reorganization of the company, some time ago, its business has been undergoing steady expansion.

The **Morris Foundry,** 20 E. Sibley street, Fond Du Lac, Wis., has purchased the old Huber drug mills property, consisting of approximately 300 ft. sq. fronting on Marquette and E. Sibley streets, upon which are 6 or 7 buildings. About March 1, the company plans to convert several of the former drug mill buildings into a foundry to be used in conjunction with the present foundry building. The cost of the project will be about $15,000. The firm specializes in bronze, brass and aluminum castings; also polishing and buffing and small machine work.

The **A. W. Cadman Manufacturing Company,** Pittsburgh, Pa., has sold its valve specialty manufacturing business to the Barrett Machine Company, specialty division, 1430 Oliver Building, Pittsburgh, Pa. This sale will permit the Cadman company to devote its entire efforts to the founding of high-quality brass and bronze castings and the manufacture of their branded babbitt metals "Acorn" and "Bearite." The present valve finishing plant will immediately be reconstructed and made an addition to the present brass and bronze foundry; new machinery and equipment of the most modern type will be installed, resulting in more than trebling the capacity of the present foundry.

Incorporations

The **Frontier Bronze Corporation,** Niagara Falls, N. Y., has been incorporated. This firm will operate the following departments: brass, bronze and aluminum foundry; brass machine shop, brazing, plating, polishing, lacquering.

The **Elliott-Wehner Foundry and Manufacturing Company,** Kansas City, Mo., has been incorporated for $20,000, for the manufacture and sale of metals and metal products, by R. S. Elliott, R. W. Elliott, and F. J. Wehner. This firm will operate the following departments: brass, bronze and aluminum foundry.

The **Best Metal Company,** Detroit, Mich., has been organized with a capital of 30 shares of no par value stock to take over the partnership of the same name formerly operated at 537 East Canfield street, and will continue to operate a smelting and refining plant. This firm operates the following departments: smelting and refining white metals, solders, babbitt; casting shop.

Ben S. Loeb, Inc., New York, has been incorporated for $100,000. They are distributors of household appliances, such as porcelain, tin ware, wooden ware, bronze, clocks, etc., and are interested in receiving catalogs of all factories manufacturing finished items for household use.

Metal and Ore Corporation, Woolworth Building, New York, has been incorporated under the laws of State of New York, to engage in international business in non-ferrous and ferrous metals and ores. Joseph J. Haesler, during the past twelve years associated with Charles Hardy, Inc., Associated Metals and Minerals Corporation, is vice-president and treasurer, and Carl Eisen, formerly president of the Eisen Trading Corporation, is president.

The **Binney Castings Company,** 1805 Clinton street, Toledo, Ohio, has been organized to manufacture high grade non-ferrous alloys. The two major metals are the non-scaling bronze for glass molds and a long life gear metal. The plant will be under laboratory control with experienced operators in charge of the foundry. **Ralph L. Binney,** for fifteen years in metallurgical work, eight of which were spent as chief metallurgist of the Bunting Brass and Bronze Company, is associated with this concern.

METAL STOCK MARKET QUOTATIONS

	Par	Bid	Asked
Aluminum Company of America	..	$71	$73
American Hardware Corporation	$100	77	85
Anaconda Copper	50	47½	47½
Bristol Brass	25	4	8
International Nickel, com.	25	41½	42
International Nickel, pfd.	100	104	105
International Silver, com.	100	131	133
International Silver, pfd.	100	107	109
National Enameling & Stamping	100	26	26½
National Enameling & Stamping, pfd.	100	82	84½
National Lead Company, com.	100	184½	185
National Lead Company, pfd.	100	117½	118½
New Jersey Zinc	100	182	184
Rome Brass & Copper	100	132	142
Scovill Manufacturing Company (new)	..	64	66
Yale & Towne Mfg. Company (new)	..	74	75

Corrected by J. K. Rice, Jr., Co., 120 Broadway, New York.

Review of the Wrought Metal Business

Written for The Metal Industry by J. J. WHITEHEAD, President of the Whitehead Metal Products Company of New York, Inc.

MARCH 1, 1927.

Business in brass and copper fabricated materials became very active during the month of February because of the fact that many buyers who had been holding off on commitments, on account of a very uncertain copper market, suddenly were forced to cover when the price of ingot copper, after a very short dip to 12½c per pound quickly turned about and shot upward. The rapidity with which the changes in price have followed one upon the other is indicated by the fact that on February 7 the lowest quotations for this movement were established, and apparently the bottom was reached in a declining market which started to slide about the end of November. With copper selling at from 12½c to 12¾c per pound, the consumers began to realize that there was very small chance for further decline, and when rumors began to circulate to the effect that there was a curtailment in production of ingot copper under way, there was a sudden rush to buy, with the result that four days later, on February 11, all prices of fabricated articles were advanced ¼c per pound. Since that time, and up to February 28 there have been further advances, so that the market now is ¾c per pound above the lowest price which was established on February 7.

The stimulus which has been provided by this rising market has resulted in a greater amount of activity in the matter of new contracts than has been seen for a number of months. As the result of this the mills are very well filled with business, and a great deal of the uncertainty which has been prevalent for sometime has been dissipated. There is probably a better feeling among consumers and producers than has existed at any time since the middle of last year. It is believed that the top for this movement has not yet been reached, but that with a normal degree of activity in general business conditions, there is likely to be still further improvement in the brass and copper business with a continued rise in prices, or at least a stable market for some time to come.

Many reports and consolidated statistics for the year of 1926 were published, showing the tremendous increase in the consumption of copper, wire, sheets, rod and tube, and many optimistic predictions made, that with the educational work that has been going on, in various lines of industry, the present year ought to see another record-breaking figure established. There is no question that the general public is now convinced of the value of non-ferrous metal, as applied to articles of daily use, and in the home, both for construction and household utensils, and it is on this foundation that the producers are hoping to build a continually expanding business.

Alloys of nickel and copper, as well as pure nickel have been selling in volume that is regarded as very satisfactory by the producers. One of the large chemical companies has placed an order for approximately 50,000 lbs. of seamless nickel tubes, for use in new plant construction. This is the largest order for seamless nickel tubes ever placed in this country, and represents a revolution in construction in that particular field. This contract was placed after nickel tubes had been tested for two years in a small way in the plant. The nickel installation replaces steel, and when it is considered that the steel cost is approximately 10% of the cost of the nickel, it is evident that the service from the nickel tubes has to be of a character so far superior to that which was given by the steel that the expenditure is justified.

Monel metal sheets have also been moving in heavy volume through channels that have already been well established, and for applications that are known to be best served by this metal. The refrigerator industry has been opening up, and while it is not yet fully under way, there are indications of a heavy demand in the next few months from that source. A new development in this line is indicated by the launching of a new line of refrigerators by the largest electrical manufacturing company in the country, and in this line monel metal is used wherever a white metal finish is required.

Taking the situation as a whole, the producers of all of these lines feel justified in looking forward to a very satisfactory Spring business.

Metal Market Review

Written for The Metal Industry by R. J. HOUSTON of D. Houston & Company, Metal Brokers, New York

COPPER

MARCH 1, 1927.

In February the copper market suffered greatly owing to adverse conditions when prices began to drop sharply during the first half of the month. There was a general weakening all along the line in a competitive effort to obtain orders. Concessions were freely offered to prospective purchasers by producers. Values finally settled to 12½ cents delivered to Connecticut Valley points. At this low basis domestic consumers became actively interested. Large orders were placed by the home trade for shipments during March, April and May. Important business also was placed by foreign buyers at 13 cents c.i.f. European points.

The large buying movement herein noted arrested the downswing of the market. Higher prices soon began to prevail, and with increased inquiries the market assumed decided firmness. The improved tone gained ground in the last half of the month, and home and foreign consumers turned buyers.

Market at this writing is firm at 13¼c@13⅜c delivered to Connecticut points.

ZINC

The situation in zinc shows decided improvement both in the domestic and foreign markets. Prices are substantially higher than a few weeks ago. At present prices, however, the margin of profit to producers is considered small. Ore sales lately were large and at an advance over previous transactions. Zinc ore has risen to $45 per ton and compares wtih a price of $42 early in February. Stocks in smelters' hands on February 1st amounted to 29,912 tons, against 21,887 tons on January 1st, an increase of 8,025 tons. Deliveries in January fell off 605 tons. Stocks are double what they were a year ago, and it seems obvious that curtailment of output would be conducive to sounder conditions for this product. Present market quotations are 6.87½c St. Louis and 7.22½c New York.

TIN

Strong underlying conditions prevailed in tin during most of the past month. A pronounced recovery took place from the low level of 64.87½c touched in January. Trading was on a large scale at advancing prices, and New York and London recorded active movements. Early in the month, however, the tone was sensitive and somewhat unsettled at 66½c for prompt Straits and 66¼c for February delivery. A conspicuous display of strength developed later and prices advanced rapidly.

Market movements during the last half of the month were naturally sympathetic with developments at London and Singapore. For a time there was a succession of increases in all markets. At one time spot Straits was selling at 71 cents per pound as against 64⅞c a few weeks ago. The market reacted at end of the month to 70 cents for March delivery, and on March 1st the tone was easier and slightly lower.

LEAD

Sales of lead were in large volume during February, and the market showed conditions of decided stability. Consumers bought freely, and activity in the domestic market gave impressive support to the position of this metal. Trade buying continued on a large scale for nearby and future deliveries. The leading producer held the price at 7.40c New York without change throughout the entire month of February. In the outside market slight premiums were obtainable at times. Good buying interest has recently developed for forward positions, and supplies are moving steadily into consumption in large volume. Attention has centered to a considerable extent on the course of the London market. Movements abroad have been noticeably firmer lately, with reports of heavy transactions for future deliveries. The strength of the situation is exemplified by the size of demand for both domestic and foreign account and suggests the likelihood of

higher markets in the near future. World production of lead by reporting countries in 1926 is estimated at 1,463,135 tons compared with 1,272,056 tons in 1925.

ALUMINUM

Volume of business was large during the past month for nearby and future shipment. The strength of influences in the domestic situation and more particularly in the automotive industry suggest that the demand for aluminum will continue on a heavy scale. Heavier consumption in Europe is also likely from reviving industry abroad. Domestic product remains very firm, and with the broad outlet for supplies the local market is maintained at 26c for 99% plus Virgin ingot and 25c for Metallurgical 94-99% grade. Imported grades are quoted at a fraction below the domestic article.

ANTIMONY

Offerings of antimony for nearby delivery depressed the market lately. Prices are lower than a month ago and on March 1st the market was quiet and quoting 13½c@13¾c for Chinese regulus duty paid. Conditions in China have been unsettled for a long time. But metal has been shipped in sufficient volume to meet demand on the basis of recent prices. Stocks are believed to be heavy in China, but consumption is holding up to a good level in this country. There is every reason, therefore, to expect good buying for forward positions during the next few months.

QUICKSILVER

The quicksilver market is firm at $102.50 to $103 per flask with sales reported on this basis. There has been a good demand from jobbers and consumers. The undertone reflects a strong situation and holders do not appear to be very anxious sellers. Foreign producers are said to be oversold and offers from abroad are limited. Imports of approximately 28,226 flasks in 1926 made a new high record and were more than double the importations in 1924.

PLATINUM

Refined platinum quotes $103 per ounce. Requirements are not specially urgent, and there has been little change in market tendency for several weeks.

SILVER

Apparently the silver situation is still more or less uncertain and subject to divergent movements. The recovery to 60 cents a short time ago was the result of buying by China and India. Market, however, eased off again on active selling for Chinese and Indian account. The Orient continues a large factor in the daily movements and it is extremely difficult to gauge the position until conditions are more favorable in the Far East. There are enormous stocks in Shanghai and India's attitude to silver will prove a major factor of economic significance. Consumption of silver will undoubtedly be great and may move to higher levels, but for a time international movements will result in frequent fluctuations and uncertain market trend before silver becomes permanently stabilized. The bullion price on March 1st was 56½c an ounce.

OLD METALS

The situation in general market conditions for scrap metals has shown some improvement lately. Improved demand from consumers and exporters set in as the result of continued firmness in the market for new copper. Heavy scrap copper and brass are wanted, and there is a distinct revival of interest for round lots of these metals. New brass clippings are also firm and bringing full prices. There is a fairly active movement in heavy lead. As a result of the more active demand, the market for the copper and brass scraps as a whole is in firm position, free from burdensome stocks apparently and prepared to respond to the improved demand at home and abroad. Dealers' buying prices are quoting 10½c@10¾c for heavy copper, 9¼c@9½c for light copper, 6¾c@7c for heavy brass, 8¾c@9c for new brass clippings, 5¾c@6c for heavy lead, 4c@4¼c for old zinc, and 18½c@19c for aluminum clippings.

WATERBURY AVERAGE

Lake Copper—Average for 1926, 14.188—January, 1927, 13.375—February, 13.125.

Brass Mill Zinc—Average for 1926, 7.783—January, 1927, 7.10—February, 7.10.

Daily Metal Prices for the Month of February, 1927

Record of Daily, Highest, Lowest and Average Prices and the Customs Duties

	1	2	3	4	7	8	9	10	11	14	15	16
Copper (f. o. b. Ref.) c/lb. Duty Free												
Lake (Delivered)	13.25	13.125	13.00	12.875	12.70	12.70	12.75	12.875	13.00	13.00	13.125	13.125
Electrolytic	13.00	12.875	12.75	12.625	12.375	12.375	12.50	12.625	12.75	12.75	12.875	12.875
Casting	12.75	12.70	12.60	12.55	12.35	12.30	12.40	12.55	12.65	12.65	12.70	12.70
Zinc (f. o. b. St. L.) c/lb. Duty 1¼c/lb.												
Prime Western	6.65	6.60	6.575	6.575	6.60	6.575	6.65	6.60	6.65	6.70	6.675	6.675
Brass Special	6.70	6.65	6.625	6.60	6.65	6.625	6.70	6.65	6.70	6.75	6.75	6.75
Tin (f. o. b., N. Y.) c/lb. Duty Free												
Straits	66.50	67	67	67.50	68.75	69.50	69	69.25	69.25	69.25	68.75	69.125
Fig 99%	64.125	65	64.75	65.375	66.25	67	66.50	66.75	66.75	66.75	66.125	66.25
Lead (f. o. b. St. L.) c/lb. Duty 2½c/lb.	7.225	7.225	7.225	7.225	7.225	7.25	7.30	7.35	7.35	7.40	7.375	7.35
Aluminum c/lb. Duty 5c/lb.	26	26	26	26	26	26	26	26	26	26	26	26
Nickel c/lb. Duty 3c/lb.												
Ingot	35	35	35	35	35	35	35	35	35	35	35	35
Shot	36	36	36	36	36	36	36	36	36	36	36	36
Electrolytic	39	39	39	39	39	39	39	39	39	39	39	39
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	14.50	15	15	15.00	15.125	15.00	15.00	14.75	14.625	14.50	14.50	14.25
Silver c/oz. Troy Duty Free	58.25	59.75	60	59.25	59.125	59	57.75	57.875	58.625	56.50	56.875	57
Platinum $/oz. Troy Duty Free	102	102	102	102	102	102	102	102	102	102	103	103

	17	18	21	*22	23	24	25	28	High	Low	Aver.
Copper (f. o. b. Ref.) c/lb. Duty Free											
Lake (Delivered)	13.125	13.125	13.125	.....	13.25	13.25	13.375	13.50	13.50	12.70	13.067
Electrolytic	12.80	12.80	12.875	.....	13.00	13.00	13.125	13.25	13.25	12.375	12.801
Casting	12.60	12.60	12.80	.....	12.85	12.85	12.95	13.00	13.00	12.30	12.661
Zinc (f. o. b. St. L.) c/lb. Duty 1¼c/lb.											
Prime Western	6.675	6.70	6.85	.....	6.825	6.85	6.85	6.875	6.875	6.575	6.692
Brass Special	6.725	6.75	6.90	.....	6.875	6.90	6.90	6.925	6.925	6.60	6.796
Tin (f. o. b., N. Y.) c/lb. Duty Free											
Straits	69.625	69.50	70.50	.....	69.875	70.25	71.00	70.50	71.00	66.50	69.059
Fig 99%	66.75	66.75	67.50	.....	67.00	67.50	68.25	68	68.25	64.125	66.493
Lead (f. o. b. St. L.) c/lb. Duty 2½c/lb.	7.30	7.30	7.30	.....	7.30	7.30	7.30	7.40	7.40	7.225	7.30
Aluminum c/lb. Duty 5c/lb.	26	26	26	.....	26	26	26	26	26	26	26
Nickel c/lb. Duty 3c/lb.											
Ingot	35	35	35	.....	35	35	35	35	35	35	35
Shot	36	36	36	.....	36	36	36	36	36	36	36
Electrolytic	39	39	39	.....	39	39	39	39	39	39	39
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	14.125	14.00	14.00	.....	14.00	14.00	13.75	13.75	15.125	13.75	14.467
Silver c/oz. Troy Duty Free	57.75	57.875	57.875	.....	57.50	57.25	57.125	56.125	60.00	56.125	57.868
Platinum $/oz. Troy Duty Free	103	103	103	.....	103	103	103	103	103	102	102.474

* Holiday.

Metal Prices, March 7, 1927

NEW METALS

Copper: Lake, 13.50. Electrolytic, 13.25. Casting, 13.00.
Zinc: Prime Western, 6.85. Brass Special, 6.90.
Tin: Straits, 70.50. Pig, 99%, 68.50.
Lead: 7.50. **Aluminum,** 26.00. **Antimony,** 13.125.
Nickel: Ingot, 35. Shot, 36. Elec., 39. Pellets, 40.
Quicksilver: flask, 75 lbs. $103.00. Bismuth, $2.70 to $2.75.
Cadmium, 60. **Cobalt,** 97%, $2.60. **Silver,** oz., Troy, 55.625.
Gold, oz., Troy, $20.67. **Platinum,** oz., Troy, $102.00.

INGOT METALS AND ALLOYS

Brass Ingots, Yellow	10 to11
Brass Ingots, Red	12 to13
Bronze Ingots	12 to14
Casting Aluminum Alloys	21 to24
Manganese Bronze Castings	23 to40
Manganese Bronze Ingots	13 to16½
Manganese Bronze Forging	32 to40
Manganese Copper, 30%	25 to35
Monel Metal Shot	28
Monel Metal Blocks	28
Parsons Manganese Bronze Ingots	18¼to19¾
Phosphor Bronze	13½to15
Phosphor Copper, guaranteed 15%	18⅞to22½
Phosphor Copper, guaranteed 10%	18 to21½
Phosphor Tin, guaranteed 5%	70 to80
Phosphor Tin, no guarantee	70 to80
Silicon Copper, 10%....according to quantity	25 to25

OLD METALS

Buying Prices		Selling Prices
11¼to11¾	Heavy Cut Copper	12¾to13¼
10¾to11¼	Copper Wire	12¼to12½
9¼too 9¾	Light Copper	10¾to11
9 to 9½	Heavy Machine Composition	10 to10¼
7½to 7¾	Heavy Brass	8¾to 9
6¼to 6½	Light Brass	7½to 7¾
7¼to 7½	No. 1 Yellow Brass Turnings	8¾to 9¼
8¼to 8¾	No. 1 Composition Turnings	9¾to10¼
6¼to 6½	Heavy Lead	7¼to 7½
4¼to 4½	Zinc Scrap	5¼to 5¾
10 to11	Scrap Aluminum Turnings	13 to15
14½to15	Scrap Aluminum, cast alloyed	18 to19
20 to20½	Scrap Aluminum, sheet (new)	22½to23
38 to40	No. 1 Pewter	42 to44
12	Old Nickel Anodes	14
18	Old Nickel	20

Wrought Metals and Alloys

COPPER SHEET

Mill shipments (hot rolled) ..... 20¾c. to 21¾c. net base
From stock ..... 21¾c. to 22¾c. net base

BARE COPPER WIRE

15½c. to 15¾c. net base, in carload lots.

COPPER SEAMLESS TUBING

24c. to 25c. net base.

SOLDERING COPPERS

300 lbs. and over in one order ..... 20½c. net base
100 lbs. to 200 lbs. in one order ..... 21 c. net base

ZINC SHEET

Duty sheet, 15%	Cents per lb.
Carlod lots, standard sizes and gauges, at mill, less 8 per cent discount	11.00 net base
Casks, jobbers' price	12.25 net base
Open Casks, jobbers' price	12.75 to 13.00 net base

ALUMINUM SHEET AND COIL

Aluminum sheet, 18 ga., base price	38c.
Aluminum coils, 24 ga., base price	34.7c.
Foreign	40c.

ROLLED NICKEL SHEET AND ROD

Net Base Prices

Cold Drawn Rods..... 53c. Cold Rolled Sheet..... 60c.
Hot Rolled Rods..... 45c. Hot Rolled Sheet..... 52c.

BLOCK TIN SHEET

Block Tin Sheet—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more, 10c or over Pig Tin; 50 to 100 lbs., 15c. over; 25 to 50 lbs., 17c. over; less than 25 lbs., 25c. over.

SILVER SHEET

Rolled sterling silver 58¼ to 60¼.

BRASS MATERIAL—MILL SHIPMENTS

In effect February 1, 1927
To customers who buy 5,000 lbs. or more in one order.

	Net base per lb. High Brass	Low Brass	Bronze
Sheet	$0.18⅜	$0.19⅞	$0.21⅞
Wire	.18⅞	.20⅜	.22⅜
Rod	.16⅛	.20⅝	.22⅝
Brazed tubing	.26⅜	.....	.31⅝
Open seam tubing	.26⅜	.....	.31⅝
Angles and channels	.29⅜	.....	.34⅝

For less than 5,000 lbs. add 1c. per lb. to above prices.

BRASS SEAMLESS TUBING

23¼c. to 24¼c. net base.

TOBIN BRONZE AND MUNTZ METAL

Tobin Bronze Rod	20⅜c. net base
Muntz or Yellow Metal Sheathing (14"x48")	18⅜c. net base
Muntz or Yellow Rectangular sheet other Sheathing	19⅜c. net base
Muntz or Yellow Metal Rod	16⅜c. net base

Above are for 100 lbs. or more in one order.

NICKEL SILVER (NICKELENE)

Net Base Prices

Grade "A" Sheet Metal		Wire and Rod	
10% Quality	26¼c.	10% Quality	29¼c.
15% "	27¾c.	15% "	33 c.
18% "	29 c.	18% "	36¼c.

MONEL METAL SHEET AND ROD

Hot Rolled Rods (base) 35 Hot Rolled Sheets (base) 42
Cold Drawn Rods (base) 43 Cold Rolled Sheets (base) 50

BRITANNIA METAL SHEET

No. 1 Britannia—18" wide or less, No. 26 B. & S. Gauge or thicker, 500 lbs. or over, 8c. over N. Y. tin price; 100 lbs. to 500 lbs., 10c, over; 50 to 100 lbs., 15c. over; 25 to 50 lbs., 20c. over; less than 25 lbs., 25c. over. Prices f. o. b. mill.

Supply Prices, March 7, 1927

ANODES

Copper: Cast	20⅛c. per lb.	**Nickel:** 90-92%	45c. per lb.
Rolled	19⅜c. per lb.	95-97%	47c. per lb.
Electrolytic	20 c. per lb.	99%	49c. per lb.
Brass: Cast	19⅛c. per lb.	**Silver:** Rolled silver anodes .999 fine are quoted from 60¼c. to 62¼c. per Troy ounce, depending upon quantity purchased.	
Rolled	19⅜c. per lb.		
Zinc: Cast	13¾c. per lb.		

FELT POLISHING WHEELS WHITE SPANISH

Diameter	Thickness	Under 100 lbs.	100 to 200 lbs.	Over 200 lbs.
10-12-14 & 16"	1" to 3"	$3.00/lb.	$2.75/lb.	$2.65/lb.
6-8 & over 16	1 to 3	3.10	2.85	2.75
6 to 24	Under ½	4.25	4.00	3.90
6 to 24	½ to 1	4.00	3.75	3.65
6 to 24	Over 3	3.40	3.15	3.05
4 up to 6	¼ to 3	4.85	4.85	4.85
4 up to 6	Over 3	5.25	5.25	5.25
Under 4	¼ to 3	5.45	5.45	5.45
Under 4	Over 3	5.85	5.85	5.85

Grey Mexican Wheel deduct 10c per lb. from White Spanish prices.

COTTON BUFFS

Full Disc Open buffs, per 100 sections.

12" 20 ply 64/68 Unbleached	$26.30–28.85
14" 20 ply 64/68 Unbleached	33.85–35.90
12" 20 ply 80/92 Unbleached	28.90
14" 20 ply 80/92 Unbleached	39.20
12" 20 ply 84/92 Unbleached	33.05–40.50
14" 20 ply 84/92 Unbleached	44.80–54.20
12" 20 ply 80/84 Unbleached	35.40–36.50
14" 20 ply 80/84 Unbleached	48.00–49.15

Sewed Pieced Buffs, per lb., bleached 60–75c.

CHEMICALS

These are manufacturers' quantity prices and based on delivery from New York City.

Acetone	lb.	.11–.16
Acid—Boric (Boracic) Crystals	lb.	.12
Chromic	lb.	.32
Hydrochloric (Muriatic) Tech., 20°, Carboys	lb.	.02
Hydrochloric, C. P., 20 deg., carboys	lb.	.06
Hydrofluoric, 30%, bbls	lb.	.08
Nitric, 36 deg., carboys	lb.	.06
Nitric, 42 deg., carboys	lb.	.07
Sulphuric, 66 deg., carboys	lb.	.02
Alcohol—Butyl	lb.	.18½–.23
Denatured, bbls.	gal.	.42
Alum—Lump, Barrels	lb.	.03¼
Powdered, Barrels	lb.	.042
Aluminum sulphate, commercial tech.	lb.	.02⅜
Aluminum chloride solution in carboys	lb.	.06½
Ammonium—Sulphate, tech. bbls	lb.	.03¾
Sulphocyanide	lb.	.65
Arsenic, white, kegs	lb.	.05
Asphaltum	lb.	.35
Benzol, pure	gal.	.60
Borax Crystals (Sodium Biborate), bbls	lb.	.04½
Calcium Carbonate (Precipitated Chalk)	lb.	.04
Carbon Bisulphide, Drums	lb.	.06
Chrome Green, bbls	lb.	.29
Chromic Sulphate	lb.	.37
Copper—Acetate (Verdegris)	lb.	.37
Carbonate, bbls.	lb.	.17
Cyanide (100 lb. kegs)	lb.	.50
Sulphate, bbls.	lb.	.05½
Cream of Tartar Crystals (Potassium bitartrate)	lb.	.27
Crocus	lb.	.15
Dextrin	lb.	.05–.08
Emery Flour	lb.	.06
Flint, powdered	ton	$30.00
Fluor-spar (Calcic fluoride)	ton	$75.00
Fusel Oil	gal.	$4.45
Gold Chloride	oz.	$14.00
Gum—Sandarac	lb.	.26
Shellac	lb.	.59–.61
Iron, Sulphate (Copperas), bbl.	lb.	.01½
Lead Acetate (Sugar of Lead)	lb.	.13¾
Yellow Oxide (Litharge)	lb.	.12½
Mercury Bichloride (Corrosive Sublimate)	lb.	$1.21
Nickel—Carbonate dry, bbls	lb.	.29
Chloride, bbls.	lb.	.17–.21
Salts, single 300 lb. bbls	lb.	.10½
Salts, double 425 lb. bbls	lb.	.10
Paraffin	lb.	.05–.06
Phosphorus—Duty free, according to quantity		.35–.40
Potash, Caustic Electrolytic 88-92% broken, drums	lb.	.09¼
Potassium Bichromate, casks (crystals)	lb.	.08½
Carbonate, 96-98%	lb.	.07
Cyanide, 165 lb. cases, 94-96%	lb.	.57½
Pumice, ground, bbls.	lb.	.02½
Quartz, powdered	ton	$30.00
Rosin, bbls.	lb.	.04½
Rouge, nickel, 100 lb. lots	lb.	.25
Silver and Gold	lb.	.65
Sal Ammoniac (Ammonium Chloride) in casks	lb.	.06
Silver Chloride, dry	oz.	.86
Cyanide (fluctuating)	oz.	.62½
Nitrate, 100 ounce lots	oz.	.42½
Soda Ash, 58%, bbls.	lb.	.02½
Sodium—Cyanide, 96 to 98%, 100 lbs.	lb.	.20
Hyposulphite, kegs	lb.	.04
Nitrate, tech., bbls.	lb.	.04¼
Phosphate, tech., bbls.	lb.	.03¾
Silicate (Water Glass), bbls	lb.	.02
Sulpho Cyanide	lb.	.45
Sulphur (Brimstone), bbls	lb.	.02
Tin Chloride, 100 lb. kegs	lb.	.48½
Tripoli, Powdered	lb.	.03
Wax—Bees, white ref. bleached	lb.	.60
Yellow, No. 1	lb.	.45
Whiting, Bolted	lb.	.02½–.06
Zinc, Carbonate, bbls	lb.	.11–.12
Chloride, casks	lb.	.06¾
Cyanide (100 lb. kegs)	lb.	.41
Sulphate, bbls.	lb.	.03½